Functional outcome in patients with sciatica after giving Epidural steroid injection.

DISSERTATION SUBMITTED IN THE PARTIAL FULFILMENT OF THE REQUIREMENTS OF TAMIL NADU DR.M.G.R. MEDICAL UNIVERSITY FOR THE DEGREE OF M.S (ORTHOPAEDIC SURGERY) EXAMINATION TO BE HELD IN APRIL 2016

Endorsement by the principal of the Medical college

CERTIFICATION

This is to certify that the dissertation entitled "FUNCTIONAL OUTCOME IN PATIENTS WITH SCIATICA AFTER GIVING EPIDURAL STEROID INJECTION" is the original work of Dr. Srujun Vadranapu towards the M.S (Orthopaedics Surgery) Degree Examinations of The Tamil Nadu Dr.M.G.R. Medical University, Chennai to be held in April 2016

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CERTIFICATION

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Dr. Kenny David, Dr. Rohit Amritanand, Dr. Justin Arockiaraj, Spinal Disorder Surgery,
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I enclose the following documents:-

1. Institutional Review Board approval 2. Agreement

Could you please sign the agreement and send it to Dr. Nihal Thomas, Addl. Vice Principal (Research), so that the grant money can be released.

With best wishes,

Dr. Nihal Thomas
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Dear Dr. Srujun Vadranapu,

The Institutional Review Board (Blue, Research and Ethics Committee) of the Christian Medical College, Vellore, reviewed and discussed your project titled "Functional outcome in patients with Sciatica after giving Epidural steroid injection" on April 02nd 2015.

The Committee reviewed the following documents:

1. IRB Application format
2. Curriculum Vitae' of Drs. Srujun Vadranapu, K. Venkatesh, Kenny David, Rohit Amritanand, Justin Arockiaraj
3. Informed Consent form & Information Sheet (English, Bengali, Telugu & Tamil)
4. No of documents 1 – 3

The following Institutional Review Board (Blue, Research & Ethics Committee) members were present at the meeting held on April 2nd 2015 in the CREST/SACN Conference Room, Christian Medical College, Bagayam, Vellore 632 002.

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We approve the project to be conducted as presented.

Kindly provide the total number of patients enrolled in your study and the total number of withdrawals for the study entitled: "Functional outcome in patients with Sciatica after giving Epidural steroid injection" on a monthly basis. Please send copies of this to the Research Office (research@cmcvellore.ac.in)

Fluid Grant Allocation:
A sum of 20, 000/- INR (Rupees Twenty thousand only) will be granted for 10 months.

Yours sincerely

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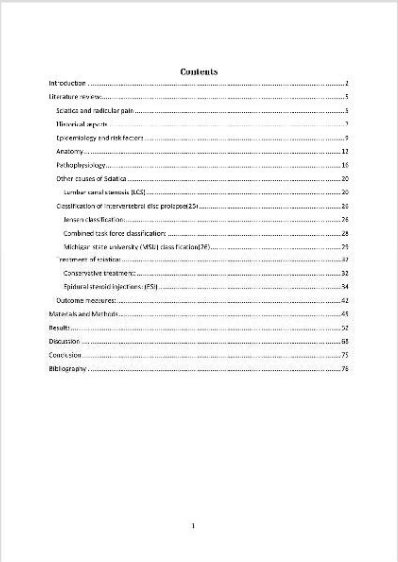

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I thank my loving and encouraging wife who sat with me through days and nights of preparing this study.

I thank my parents for their encouraging words and prayers.

I thank my most dear sister for the encouragement and the tech support she gave.

Abstract

Title of the study: Functional outcome in patients with sciatica after giving epidural steroid injection.

Department: Department of Orthopaedic surgery, Christian Medical College, Vellore.

Name of the candidate: Dr. Srujun Vadranapu

Degree and Subject: MS degree, Orthopaedic Surgery

Name of the Guide: Dr. Venkatesh. K

Objectives:

1. To study the Functional outcome in patients with Intervertebral disc prolapse and lumbar canal stenosis post epidural steroid injection (ESI)
2. To find out the Michigan state university grade most responsive to ESI.

Materials and Methods:

A prospective cohort study on the functional outcome of patients with sciatica proven to have Intervertebral disc prolapse or lumbar canal stenosis. Outcome measures used in this study are Owestry disability index score and Numerical rating scale. All patients were taken an MRI scan, which was classified according to the Michigan state university classification. After initial check up, pre-anaesthetic check up, selected patients were given Epidural injection of Methyl Prednisolone and local anaesthetic Bupivacaine. Patients were scored at 24 hours, 1 month, 3 months and 6 months after the injection was given and the data was entered in epidata.

Results:

A total of 91 patients were given ESI in the study period i.e., January 2015 to March 2015. 50 patients were included in the study as per the inclusion and exclusion criteria. Ages from 20-80 were included. Average pre-injection ODI scores were 57.22, at 24 hrs 46.35, 1 month 31.18, 3 months 28.04 and at 6 months 27.95 with a *p* value of <0.001. Mean NRS ratings pre injection were 4.64 and at 6 months was 1.73. The MSU grade most common among the study group was 2A and the type with worst prognosis was 2AB with 3 out of 5 patients getting operated in the study period.

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Introduction

Low back pain is one among the most common complaints with which patients go to a physician. Low back ache is so common that at least 80% of the population will get it at some point of their lives.(1) Sciatica (Radiating leg pain with or without low back pain) is a common symptom and occurs in approximately 40% of adult population at some point of time but clinically significant sciatica is only 4%-6%.(2)

Intervertebral disc prolapse(IVDP) seems to be the most common cause of Sciatica but some patients with features suggesting sciatica won't show any disc prolapse in MRI or CT scan while some people with no symptoms show disc prolapse making it a paradox.(3) This paradox led to thinking of alternate explanations that prolapsed intervertebral disc in itself is not sufficient to produce features of sciatica and there must be some local chemical contribution causing the insult on the nerve roots.(3) As the technology advanced, the understanding about sciatica improved leading to understanding that pathogenesis of sciatica was mediated by Inflammation, immunity and mechanical compression.(4) Phospholipase A2 which is a natural component of intervertebral disc triggers release of Arachidonic acid which is a precursor of Leukotrienes and prostaglandins causing inflammation of the nerve roots. High levels of PLA2 was found in the epidural space and the prolapsed disc material .(5)

Steroids are supposed to reduce the inflammatory response induced by chemical, immunologic and mechanical lesions.(6) Steroids can be used in sciatica patients when they don't respond to NSAIDs (Non steroidal anti-inflammatory drugs) as steroids inhibit

inflammation at a higher place in the cascade than the NSAIDs. Local delivery of steroids into the epidural space gives a concentrated dose which will cause an effect that lasts longer. So, in patients who don't respond to the conservative treatment and are not indicated for surgical treatment, Epidural steroid injections can be given. Epidural steroid injections were being used as treatment for sciatica since they were introduced around 60 years ago. Multiple studies were performed on this subject and still the results were controversial.

Michigan state university grading of the intervertebral disc prolapse is a relatively new form of grading the IVDP. This grading system gives the precise size and location of the prolapsed intervertebral disc.(7)

Our study is aimed at the functional outcome in patients with sciatica after giving epidural steroid injection.

Hypothesis

There will be a significant improvement in the patients with IVDP and LCS post ESI

Aims and Objectives

1. To study the functional outcome of patients with Intervertebral disc prolapse (IVDP) and Lumbar Canal Stenosis (LCS) after ESI.
2. To find out the Michigan state university grade of IVDP most responsive to ESI.

Literature review:

Sciatica and radicular pain

Sciatica and radicular pain can be considered as synonymous

Radicular pain is distinguished from nociception by the axons being stimulated along their course; their peripheral terminals are not the site of stimulation.

Ectopic activation may occur as a result of

1. Mechanical deformation of dorsal root ganglion
2. Mechanical stimulation of previously damaged nerve roots
3. Inflammation of a dorsal root ganglion and
4. Possibly ischaemic damage to the dorsal root ganglia

<u>Differences between radicular and referred pain</u>

Referred pain is felt deeply, aching in quality with a recognizable, constant central region and margins hard to define.

Radicular pain is lancinating in quality, may be perceived along the narrow bands reminiscent but not identical to the bands of dermatomes

Radicular pain has a cutaneous quality along with a deep component where as referred pain has only deep component.

Table 1: Differences between radicular pain and referred pain.

Radicular pain	**Referred pain**
Lancinating	Dull aching
Perceived along dermatomal distribution	Deep visceral pain
Has a cutaneous component and deep one	Only deep component
Felt along narrow bands	Constant central region with indefinite margins

Historical aspects

Ancient Greeks used the sciatica to describe pain around hip and thigh.

Hippocrates described a "Ischiatic pain" affecting men from 40-60 years of age which lasted for 40 days and was self resolving. He also noted that pain radiating to foot was good prognostic sign whereas localized pain to hip was not.

Italian anatomist- Domenico Cotugno (1736-1822) wrote the first book on sciatica. Sciatica was known as Cotugno's disease for many years. He distinguished between the nervous disease sciatica and aching pain associated with low back pain. He also said Sciatica could be intermittent or continuous, and continuous can become intermittent but the vice versa was not possible.

In 19th century it was believed that inflammation of the sciatic nerve due to various rheumatic conditions was causing Sciatica.

Fuller, in his book Rheumatism, Rheumatic Gout and Sciatica (1852) expressed the history of sciatica as pathological ignorance and therapeutic failure.

Intervertebral disc was implicated as a causative factor for Sciatica in 20th century.

Schmorl and Andrae (1929) described prolapsed intervertebral discs in cadavers but did not link them sciatica

Eslberg (1931), a neurosurgeon, described ‘tumours’ in the spinal canal on the removal of which there was symptomatic relief in patients with sciatica. He also thought these ‘tumours’ could be prolapsed intervertebral discs. But this idea was rejected earlier.

Mixter and Barr reviewed the pathology of all excised Chondromas of the spine held in Harvard Medical School pathology museum and they found that 10 out 16 specimens contained normal disc material. They concluded that sciatica and the neurologic sequelae were results of prolapsed intervertebral disc. Six months after this study, a patient was diagnosed pre-operatively to have a ruptured intervertebral disc and was operated in Massachusetts General Hospital which led to the landmark paper published in New England Journal of Medicine. Since the intervertebral disc prolapse was irreversibly linked to the pathogenesis of Sciatica.

Until the idea was challenged by Kelly, who felt pressure on a nerve would lead to loss of function rather than pain, pressure on the nerve was thought to be the cause of pain in Sciatica. At about the same time, Lindahl and Rexed noticed features of

inflammation in lumbar nerve roots at laminectomy and thereby leading to the theory of inflammatory component in intervertebral disc prolapse.

Epidemiology and risk factors

At some point of time in life at least 80% of the population will experience low back pain. Sciatica affects as many as 40% of the total population of which only 4%-6% have clinically significant sciatica.(2) About 90% of the patients with sciatica recover naturally with conservative measures over a period of 1 year.(8) To reduce this natural recovery time numerous authors advise local delivery of steroids and anaesthetics near the affected nerve roots.(9)

Multiple factors which were thought to influence the development of sciatica were studied like body habitus, gender, parity, age, genetic factors, occupation and environmental factors. No relationship was found with gender and body mass index (BMI) in the development of sciatica, but increased BMI was associated with low back pain. Body height may be a risk factor but only in age group 50-64 and parity of six or more is also found to be associated. Age was found to be a risk factor as sciatica is rare before 20 years and the odds ratio increases 1.4 for every 10 years increase in age up to 64.

A genetic link also was established, first reported in juvenile population.(10) But later in multiple prospective and retrospective studies it was found that the first degree relatives of the patients presenting for lumbar disc surgery had increased incidence of sciatica.(11,12) Reported heritability was 20.8% in patients who reported sciatica and 10.6% for patients who were admitted in the hospital with sciatica.(13)

Recreational activities like walking and jogging were studied. Walking was found to increase the chances of getting sciatica in people who were pain free and jogging was shown to have a dual effect. In people who didn't have prior history of sciatica, jogging was found to be a negative predictor whereas in people who had history of sciatica, jogging increased the risk of recurrence.(14)

Occupations like carpenters and machine operators were shown to have positive influence. Driving is also found to be positively associated with sciatica or lumbar disc herniation. While driving, the body is exposed to a vibration frequency of 4-5Hz which may coincide with the resonant frequency of the spine in sitting position which will lead to a direct mechanical effect. Retired or part-time farmers were found to have less incidence.

Relationship between sciatica and smoking was studied and several hypotheses were proposed. Different hypotheses linking sciatica with smoking were:

1. Metabolic balance in the intervertebral disc was disturbed by tobacco.
2. Intra-discal pressures will be elevated markedly with coughing which is common in smokers.
3. A possible fibrinolytic effect of tobacco was also proposed.

Goldberg, Scott and Mayo reviewed 8 studies relating Intervertebral disc prolapse to smoking and concluded that the statistical association of smoking with IVDP cannot be ruled out as an artefact and needs more studies.(15)

Table 2: Factors associated with development of sciatica

Positive influence
Age
Genetic pre-disposition
Walking
Increasing height in old ages
Jogging – If there is history of pain before starting jogging
Occupation
Smoking
No influence
Gender
Body mass
Parity
Negative influence
Jogging – when there is no baseline history of sciatica.

Anatomy

The structure of intervertebral disc is complex. Nucleus pulposus has a well organized matrix which is laid down by relatively few cells. Nucleus pulposus is a gelatinous structure present in the centre and is contained in the periphery by annulus which is collagenous and cartilaginous and two cartilaginous endplates cephalad and caudad. Collagen fibres from annulus continue and attach to the surrounding tissues, tying into the vertebral body along its rim, cartilaginous endplates superiorly and inferiorly and anterior and posterior longitudinal ligaments. Bony endplate and cartilaginous endplates were connected by calcified cartilage. At birth, the disc has a direct blood supply in the annulus and endplates which disappears by the age of 1 year and from then on the disc material doesn't have any blood supply. Over time, the water content of gelatinous nucleus decreases and altered proteoglycan composition which will lead to fibrous consistency of the nucleus which in turn will lead to fissures in the annulus and endplates through which new blood vessels sprout. These changes lead to increased cellular proliferation and also cell death leading to more degeneration. Cartilaginous endplates become sclerosed. There are two types of cells – annulus type and nucleus type cells. Annulus cells resemble fibroblasts and nucleus cells resemble chondrocytes. These cells will form Type I cartilage and type II cartilage respectively.

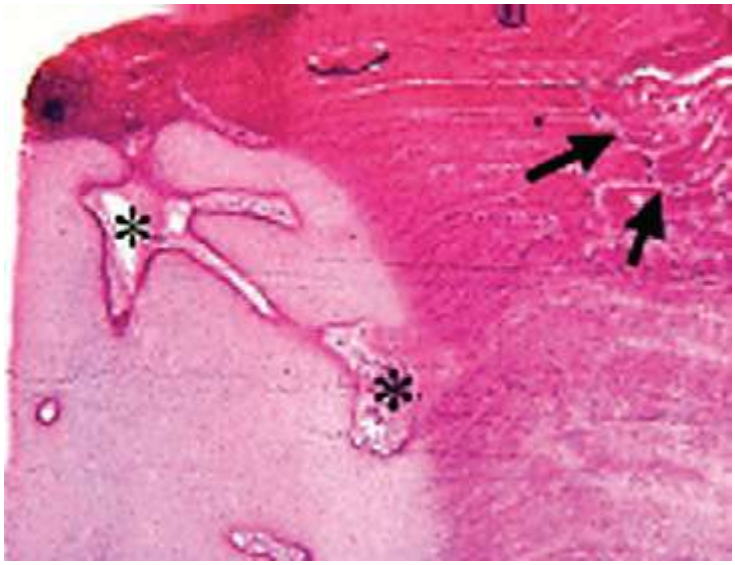


Figure 1: Specimen from the annulus of a neonate showing the blood vessels and vascularised channels.(16)

Nomenclature of intervertebral disc is such that it takes the name of the vertebra cephalad to it. The disc between L4 and 5 will be called L4 disc.

Dorsal root ganglion (DRG) is present at the level of the intervertebral foramina and it is in the confines of the foramina. Three branches arise distal to the DRG- Ventral ramus, dorsal ramus and sinuvertebral nerve. The ventral ramus is the most prominent and most important branch and it supplies the structures ventral to the neural canal. Second branch is the sinuvertebral nerve is a small branch arising from the ventral ramus traverses medially over the posterior aspect of the disc, vertebral body and posterior longitudinal ligament and supplies these structures. Third branch, the dorsal ramus courses dorsally and pierces the intertransverse ligament near the pars

interarticularis and divides into 3 branches which supply the structures dorsal to the neural canal. The lateral and intermediate branches supply the posterior musculature and skin while the medial branch divides into 3 branches and supplies the facet joints at and the adjacent levels.

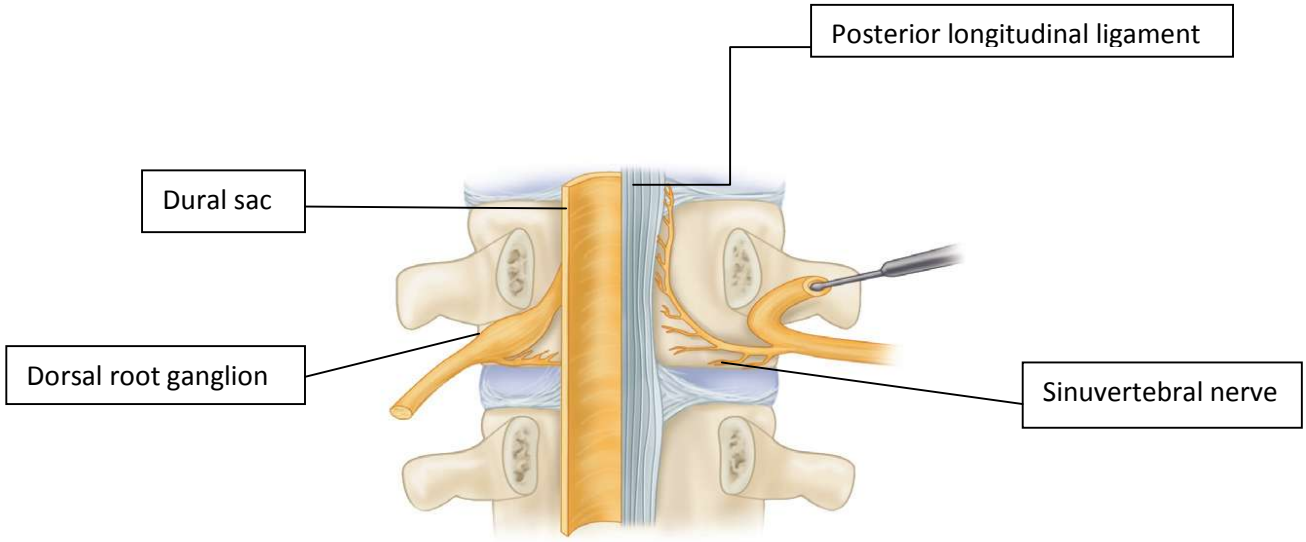


Figure 2: Dorsal view of lumbar spinal segments with lamina and facets removed.(16)

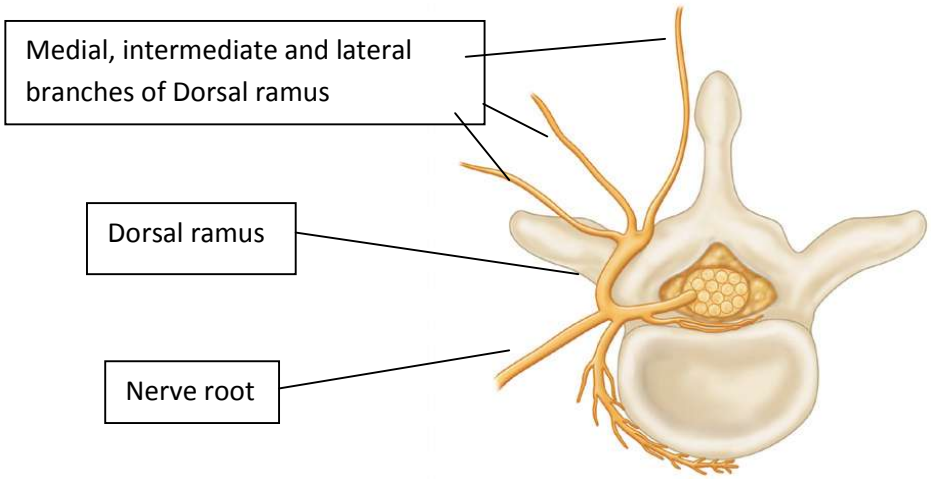


Figure 3: Cross section view of spine at the level of endplate and disc.(16)

Epidural space is a thin, potential space which is a circular compartment surrounding the thecal sac extends between the Dura mater and overlying ligamentum flavum and the posterior margin of the intervertebral disc. Epidural space contains the nerve root with its Dura, veins, adipose tissue and loose areolar tissue.

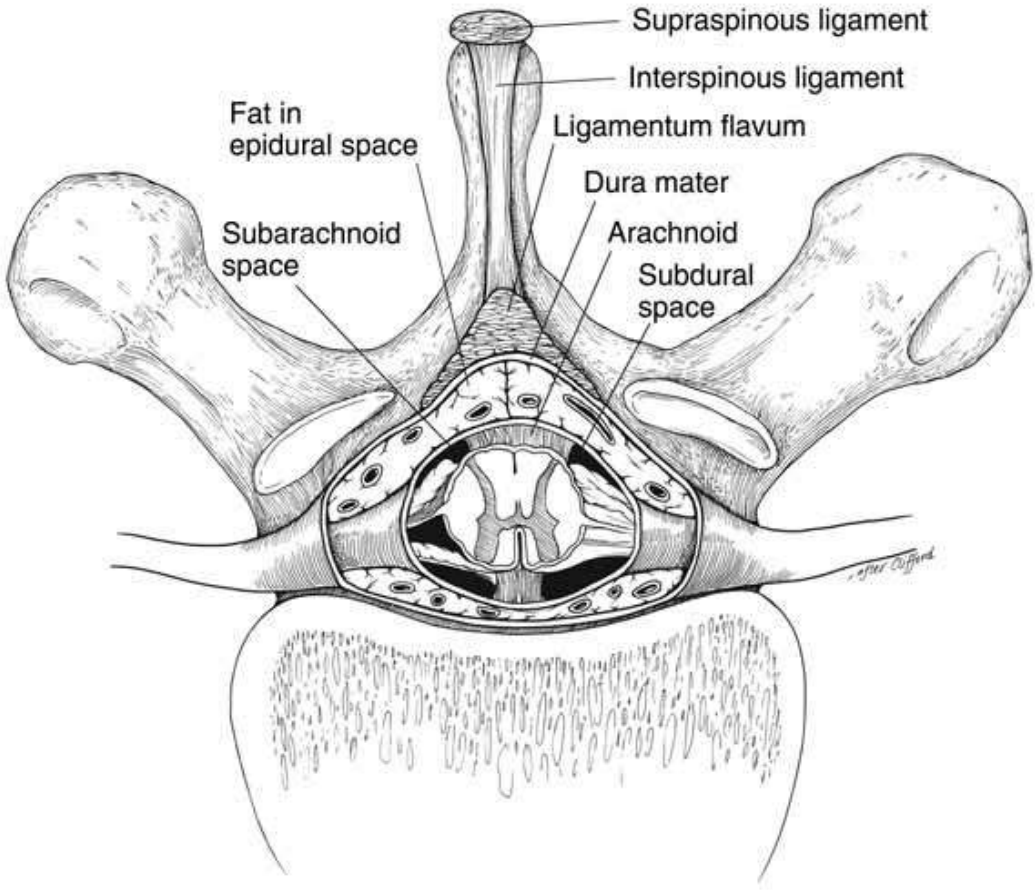


Figure 4: Cross section of lumbar spine with detail of the epidural space(6)

Pathophysiology

Sciatica occurs due to a combination of Mechanical compression exerted by the protruding intervertebral disc, inflammation and immune mediated. Each of the factors is described in detail as follows.

Inflammation:

Earlier compression of the nerve roots by the prolapsed intervertebral disc was implicated in pathophysiology of sciatica. Kelly however proposed that pressure on nerve will result in functional loss and rarely causes pain. In a prospective study Takahashi et al studied the contact pressure between the lumbar disc herniation and compared with the clinical features. They concluded that magnitude of nerve root pressure was not correlated with the degree of Straight leg rising(SLR) but with severity of the neurological deficits.(17)

Lindahl and Rexed proposed that inflammation rather than compression of nerve roots was the cause of sciatica pain after they found histological evidence of inflammation in the posterior nerve roots examined during laminectomy. (4)

Saal et al found Phospholipase A2 (PLA2) in high levels in the herniated discs. PLA2 is the enzyme which helps in production of Arachidonic acid from cell membrane which is the precursor of Leukotrienes and Prostaglandins.(5) PLA2 is found to be

higher in cases of disc sequestration than in bulging with a strong correlation between plasma PLA2 levels and disc.(18)

Cytokines were also implicated in production of an inflammatory response. Interleukin (IL)6 and IL 8 were found in high levels in the disc material removed in patients who underwent surgery for Sciatica and back pain. Level of IL 6 was not found to correlate with the symptoms of sciatica but of the amount of stenosis in LSS (Lumbar spinal stenosis). (19) Tumour necrosis factor α (TNF α), which is known to induce synthesis of Nitric oxide (NO), which is potent mediator in causing inflammation. Brisby et al in their animal study found that nitric oxide synthase activity was found in rats exposed to nucleus pulposus in contrast to the controls which underwent a sham operation. In pig models it was found that the effects of Nitric oxide (NO) were less after giving systemic aminoguanidine, a nitric oxide synthase inhibitor.(20)

The cytokine which appears to be most strongly associated with the inflammatory processes of nucleus pulposus is TNF α. In an animal study conducted by Olmarker and Larsson in 13 pigs, they identified presence of TNFα in the nucleus pulposus material by staining it immunohistochemically. Then they harvested the nucleus pulposus from the lumbar discs and injected it into the sacrococcygeal cauda equina autologously. They found that the pigs in which Doxycycline, a compound that inhibits the effects of TNFα was injected, showed better nerve conduction velocities

than the controls.(21) In a study conducted by Krappinen et al, they injected infliximab to 10 patients with sciatica and compared the results with 62 historical controls. They reveal a promising result in the test subjects.(22)

Immunity:

Central and peripheral nervous system consists of abundant amounts of Glycosphingolipids. (GSLs). Antibodies to GSLs are usually in very low titres in normal human beings but they are found to be elevated in auto-immune conditions such a Guillian Barre syndrome. These antibodies to GSLs are also found in patients with sciatica, both acute and chronic and also in patients who underwent discectomy. (4)

Neurofilament (NFL), glial fibrillary acidic protein, S-100 protein and neuron-specific enolase are the markers of glial cell and neuronal damage. These marker levels were measured in Cerebrospinal fluid (CSF) of patients who present for lumbar disc surgery and were compared to controls. NFL and S-100 protein levels were found to be significantly high in the test subjects than in controls. It was also found that NFL levels were higher in patients whose symptoms were of shorter period than 3 months than those whose symptoms were longer. These features were suggestive of immunological mechanism of sciatica.

Mechanical compression:

In an observational study by Aota et al, they found that there was swelling and impingement on the specific nerve roots in neural foramina and the amount of swelling was directly proportional to the symptoms.(23)

In an animal study conducted by Onozava et al, they studied the effects of Nitric oxide on rats with and without cauda equina compression. They found that the rats with cauda equina compression showed a marked increase in firing rate along the sciatic nerve leading to the theory which suggests that compression caused by herniated intervertebral disc decreases the threshold of the nerve roots to their response to nitric oxide.(24)

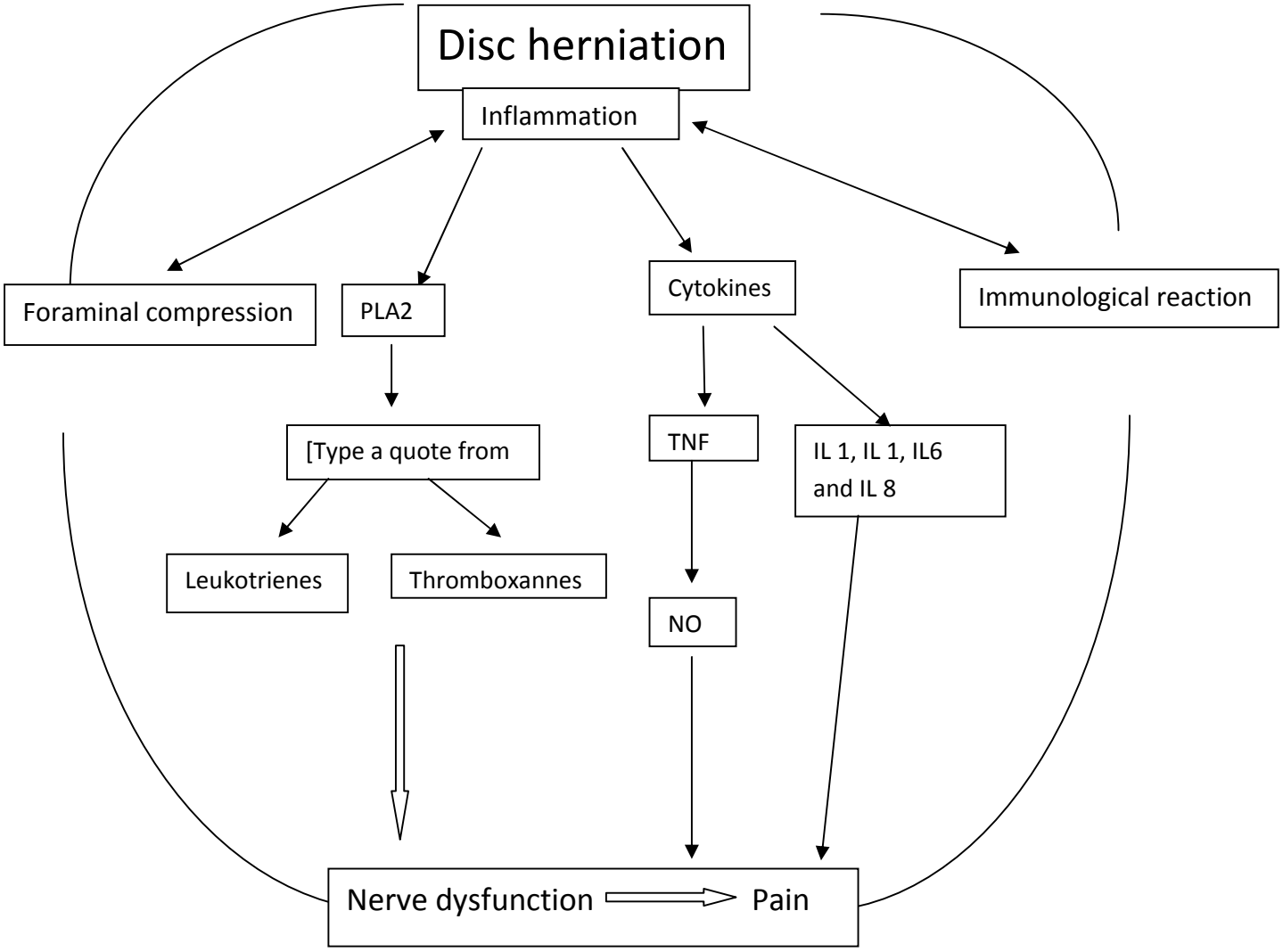


Figure 5: An overview of the pathophysiology of sciatica secondary to intervertebral disc prolapse.(4)

Other causes of Sciatica

Intervertebral disc prolapse is by far the most common cause of sciatica but not the sole cause. Sciatica can be produced by multiple other causes.(4) Figure 8)

Lumbar canal stenosis (LCS) is one of the commoner causes which produce symptoms of sciatica. LCS is the narrowing of the central spinal canal, lateral recess or the neural foramen.(25)

Pathogenesis:

Central canal stenosis is caused by the ligamentum flavum hypertrophy, osteophyte formation in the facet joints, and degenerative spondylolisthesis.

Lateral recess stenosis is caused by compression from the medial aspect of the superior facet and posterior aspect of the intervertebral disc and vertebral body. In lateral recess stenosis traversing nerve root is compressed

Foraminal stenosis is a rare form and occurs in isthmic type of spondylolisthesis. In foraminal stenosis the exiting root is compressed. This type of stenosis can also occur in far lateral disc prolapse.

Lateral recess stenosis and foraminal stenosis are different entities with different clinical implications.

Classification:

Postacchini classified LCS into 3 types.(Table I)

Primary (congenital),

Secondary (acquired) and

Combined types.

Congenital type is rare. There will anatomical abnormalities such as short pedicles in achondroplasia. Other causes include hereditary exostosis, Morquio's syndrome (autosomal recessive mucopolysaccharide disorder), hypochondroplasia, diastrophic dwarfism and cheirolumbar dysostosis.

Acquired stenosis is usually result of degeneration in the fifth to seventh decade and is common.

Anatomically LCS can be classified as Central stenosis, Lateral recess stenosis and foraminal stenosis as described above.

Hansraj et al divided LCS into typical and complex types.(Table II)

Table 3: Aetiological classification of LSS

Aetiological classification of lumbar canal stenosis
Congenital
Idiopathic
Achondroplastic
Acquired
Degenerative
Iatrogenic – post-surgical
Metabolic – Fluorosis, Paget's disease
Post-traumatic
Stenosis due to spondylolisthesis
Combined
Congenital with secondary degenerative changes

Table 4: Hansraj classification of LSS

Typical lumbar spinal stenosis
•No previous lumbar spine surgery
•No evidence of instability in radiography
•Degenerative spondylolisthesis < grade I, with no instability
•Degenerative scoliosis with < 20° of curve
Complex Lumbar Canal Stenosis
•Previous lumbar spine surgery
•Evidence of instability in radiography
•Radiographic evidence of post op junctional stenosis
•Degenerative spondylolisthesis > grade I, with instability
•Degenerative scoliosis with > 20° of curve

Clinical features:

Symptoms are insidious onset and present in sixth or seventh decade.

Central canal stenosis presents with bilateral leg symptoms which are usually vague. Most important symptom though is neurogenic claudication presenting as numbness, weakness or discomfort in the legs. The symptoms are better on flexion at spine as it will increase the space available for cauda equina and unfolds the ligamentum flavum.

Lateral recess stenosis will cause unilateral leg pain which starts in the lower back, and radiates to buttock, posterior aspect of thigh and calf. Pain usually is influenced by posture.

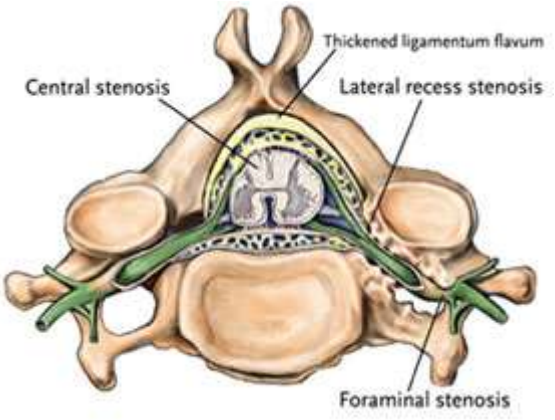


Figure 6: Lumbar canal stenosis

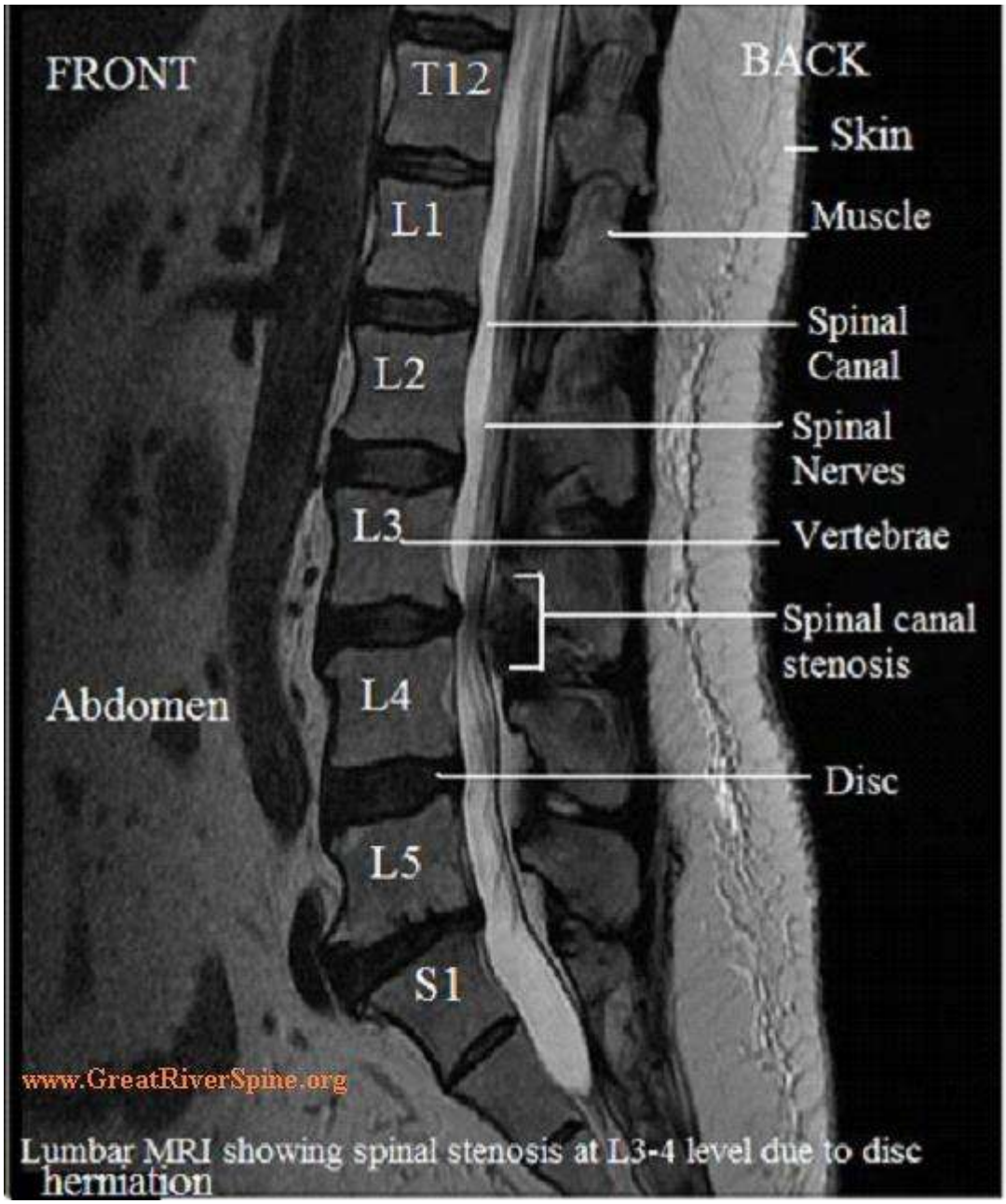


Figure 7: MRI showing lumbar canal stenosis

Other causes of sciatica include malignancies, infection (staphylococcal epidural abscess, caseating tuberculosis, chronic infection of lumbar intervertebral discs with Propionibacterium acnes), vascular compression, pseudo aneurysm of gluteal artery, mechanical compression of lumbar nerve roots by osteophytes around sacroiliac (SI) joints.

Table 5: Non- discogenic causes of Sciatica

Non- discogenic causes of sciatica	
Infection	Caseating TB, Abscess, discitis
Malignancy	Bone or soft tissue sarcoma, metastasis, Sciatica neuroma
Bony compression	Spondylolisthesis, spinal stenosis, Osteophytes from SI joint
Muscular	Piriformis syndrome
Vascular compression	Pseudoaneurysm of gluteal artery, abnormal pelvis venous plexi
Epidural adhesions	
Gynecological	Uterine fibroids and pelvic endometriosis

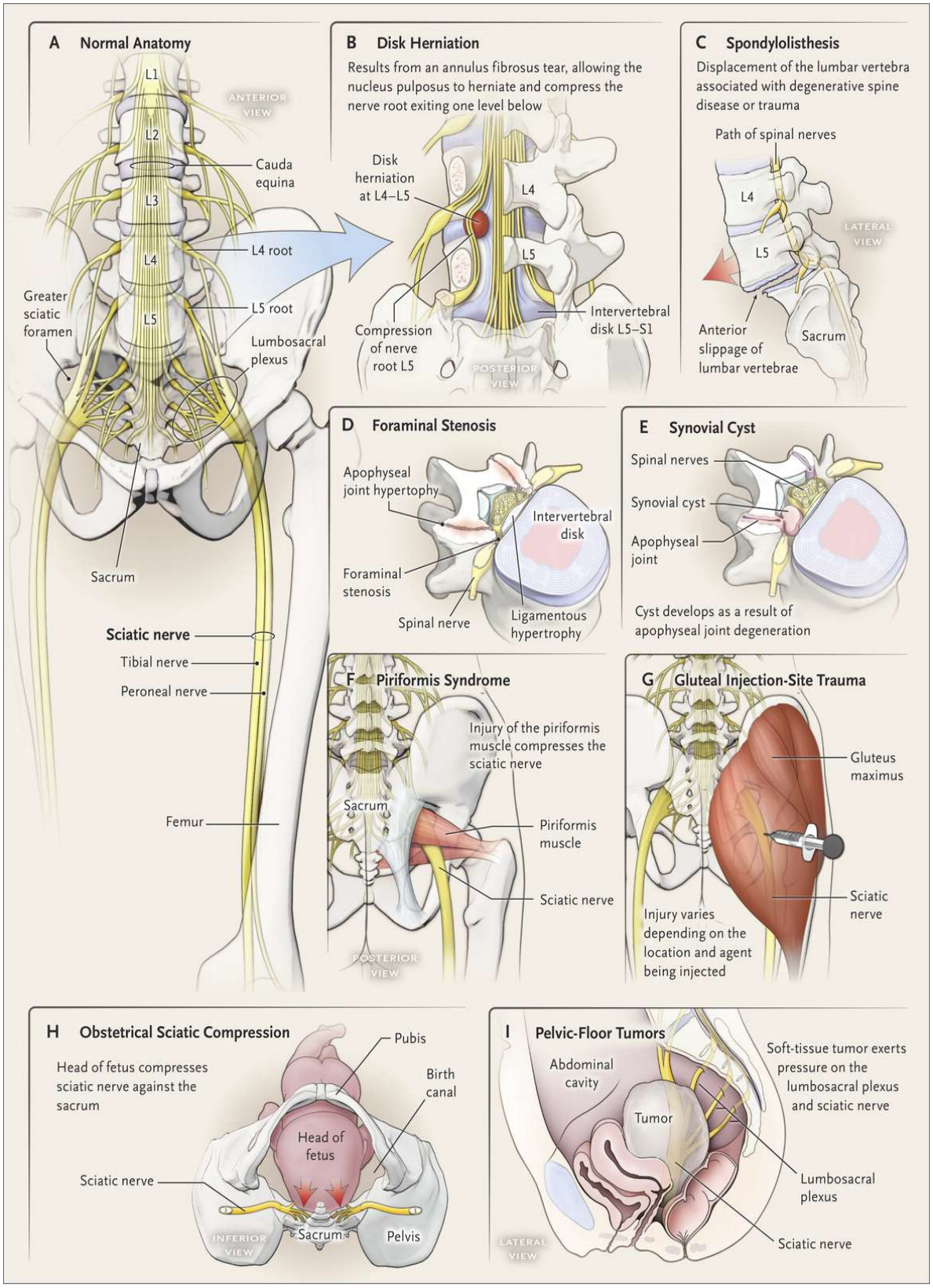


Figure 8: Showing the different causes of sciatica(26)

Classification of intervertebral disc prolapse(27)

There are many classification systems described for the intervertebral disc prolapse and nerve root compression like Jensen, CTF (Combined task force), Van Rijn, Pfirrmann and MSU (Michigan state university) classifications.

Jensen classification:

Figure 9: Normal disc

Figure 10: Disc bulge

Figure 11: Disc protrusion

Figure 12: Disc extrusion

Normal disc: Lumbar disc does not cross the interspace.

Bulge: Circumferential and symmetric extension of the disc beyond the interspace.

Protrusion: Focal extension of the disc beyond the disc space with the base wider than the apex

Extrusion: Focal extension of the disc beyond the disc space with the base thinner than the apex

Combined task force classification:

Disc herniation is classified according to the percentage of extension of the disc compared with the total disc circumference.

Focal disc herniation: <25%

Broad based herniation: 25%-50%

Disc bulge: >50%

Herniated discs are further divided into protrusions or extrusions, as described above in the Jensen classification.

Pfirrmann and Van Rijn classifications are mainly based on the nerve root compression and are not described here.

Michigan state university (MSU) classification(28)

This is the most recent classification system of lumbar disc herniation published in 2010.

MSU classification uses the MRI and grades according to the size and location of the disc herniation.

A single intrafacet line is drawn which will help in determining the size of the herniation. If the herniated disc does not extend up to the 50% of the distance between the non-herniated posterior aspect of the disc and the intrafacet line, it is termed size 1, if it crosses 50% of the area, it is termed 2 and if it crosses the intrafacet line itself it is termed as 3.

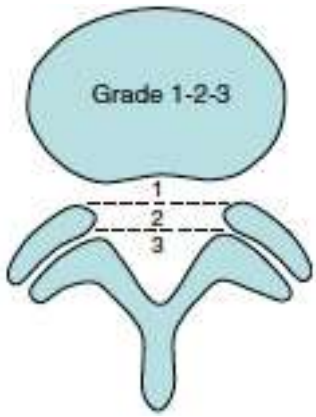


Figure 13: Grading of size of herniated disc (7)

Location of the herniated disc is measured or grade by placing 3 point in the intrafacet line dividing it into 4 equal quadrants. Now three perpendicular lines are along these points, dividing the space into 4 quadrants, Right central and right lateral, Left central and left lateral quadrants. Central quadrant is termed A, lateral quadrant is termed B. Locations C represents the foramina which extends lateral to medial margin of either facets and lateral to the lateral most line

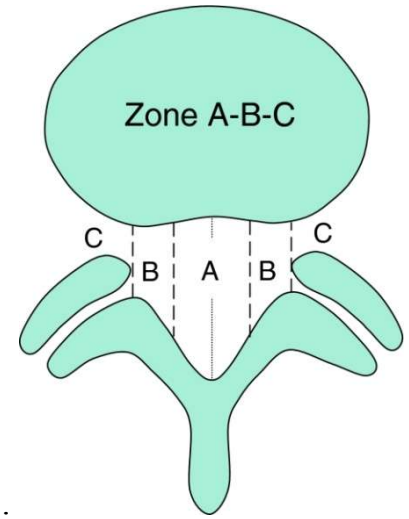


Figure 14: Showing how the location of the herniated disc is graded.(7)

The lesion is quantified or graded as A, AB, B or C on the basis of the zone into which the herniated nucleus pulposus extends furthest.

In the study conducted by Lawrence et al, there was 98% agreement in the grading of the disc herniation among 3 surgeons.

This classification system is being used in this study.

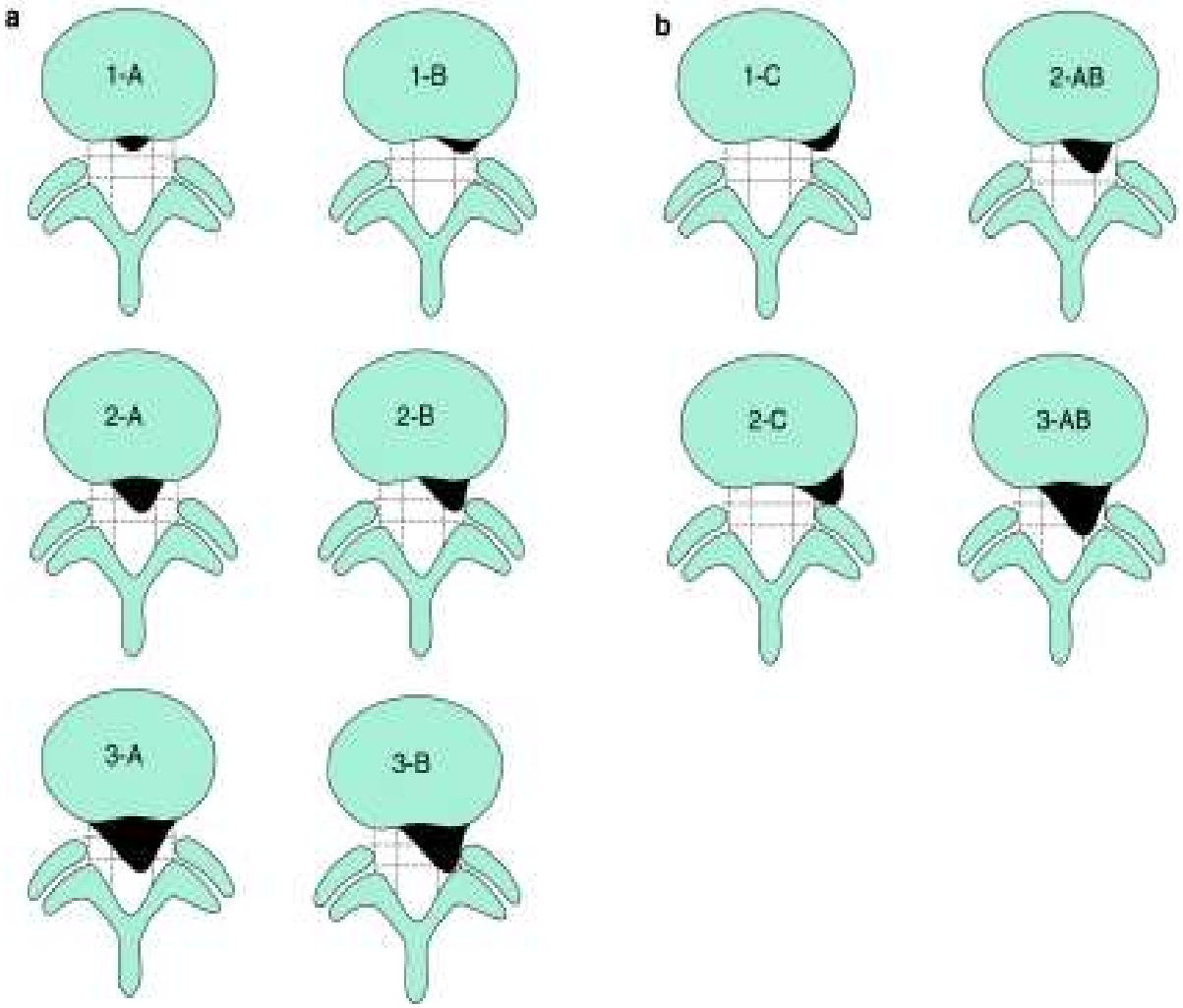


Figure 15: Showing the different possible grades of intervertebral disc prolapse according MSU classification in MRI scan(28)

Treatment of sciatica:

Sciatica resolves in most of the patients without any treatment.(26)

Conservative treatment:

The initial treatment most commonly given for sciatica is pain control by means of drugs and activity control. In a double blinded randomized control study conducted by Vroomen et al, they concluded that bed rest is not more effective therapy as that of watchful waiting.(29)

Medical therapy:

Drugs like NSAIDs, Oral steroids, Opioids, Anticonvulsants, antidepressants, gabapentin, pregabalin and muscle relaxants were all being tried in the short term management of Sciatica with little data that supports to do so.(26)

Physical therapy:

Benefits of physical therapy are difficult to determine and out of the many regimens, nothing is proven to be superior, but they all seem to be safe.

Different programs include:

1. Directional preference exercises (This kind of exercises help in moving the locus of pain proximally to mid back where it is tolerated better than the lower back.)(30)
2. Motor – control exercises or specific stabilization exercises. They aim at enhancing the control of transverses abdominis and multifidus muscles.
3. Core strengthening exercises
4. Stretching and
5. General fitness exercises.

Traction:

In a Cochrane database systematic review conducted by Wegner et al, they concluded that there is little or no impact on pain intensity, global improvement, functional status or return to work. So they advised that traction, either manual or mechanical should not be promoted.(31)

Epidural steroid injections: (ESI)

Epidural steroid injections have been in practise for the treatment of sciatica since they were introduced in 1950s (in 1953 by Lievre et al).

If it is accepted that the pathophysiology of sciatica includes, inflammation, immunity and mechanical compression, the effects of steroids as anti-inflammatory and immunosuppressant actions should help in decreasing the swelling and nerve root irritation.(4)

Rationale for ESI

By injecting the Corticosteroid in the epidural space, the idea is to deliver the steroid directly onto sciatic nerve roots, thereby decreasing the local inflammation and decreasing the dose required, systemic absorption and in turn the associated systemic adverse effects.(4)

Indications of ESI(32):

1. Lumbar radicular pain- Causing functional impairment.
   - Not responding to conservative treatment for >4 weeks
   - Imaging showing nerve impingement in the same level.

2. Neurogenic claudication (same as above)

3. Low back pain (LBP) -high level athletes during a competition
   - Pregnant women intractable LBP unresponsive to other treatments.
4. Post herpetic neuralgia(33)

Contraindications:(32)(33)

1. Infection- either systemic or local
2. Bleeding disorders or fully anticoagulated with anticoagulant medications.
3. Cauda equina syndrome
4. Patient refusal

   <u>Relative contraindications</u>

5. Uncontrolled Diabetes mellitus
6. History of immunosuppression
7. Congestive cardiac failure

Types of Epidural steroid injections:

1. Interlaminar approach:

   Interlaminar approach does not need fluoroscopic guidance and so no risk of radiation exposure. But the drug may not reach the target nerve root.

   In the systematic review conducted by L. Manchikanti et al(34), they concluded that the level of evidence is strong for a short term relief and limited for long term relief in this approach.

2. Transforaminal approach:

   Transforaminal approach needs fluoroscopic guidance and the drug is directly introduced around the target nerve root increasing the chances of it leading to good relief. The systematic review as stated above concluded that the level of evidence is strong for short term relief and moderate for long term improvement.

3. Caudal approach:

   Caudal approach is easiest of all but needs a large volume for injection. The study concluded that the level of evidence is strong for short term relief and moderate for long term relief.

   Drugs used in epidural steroid injections are Methyl prednisolone, Dexamethasone, Triamcinolone and Betamethasone. Previously Hydrocortisone was used, but due to its short duration of action and reports of Seizures, its use was discontinued.

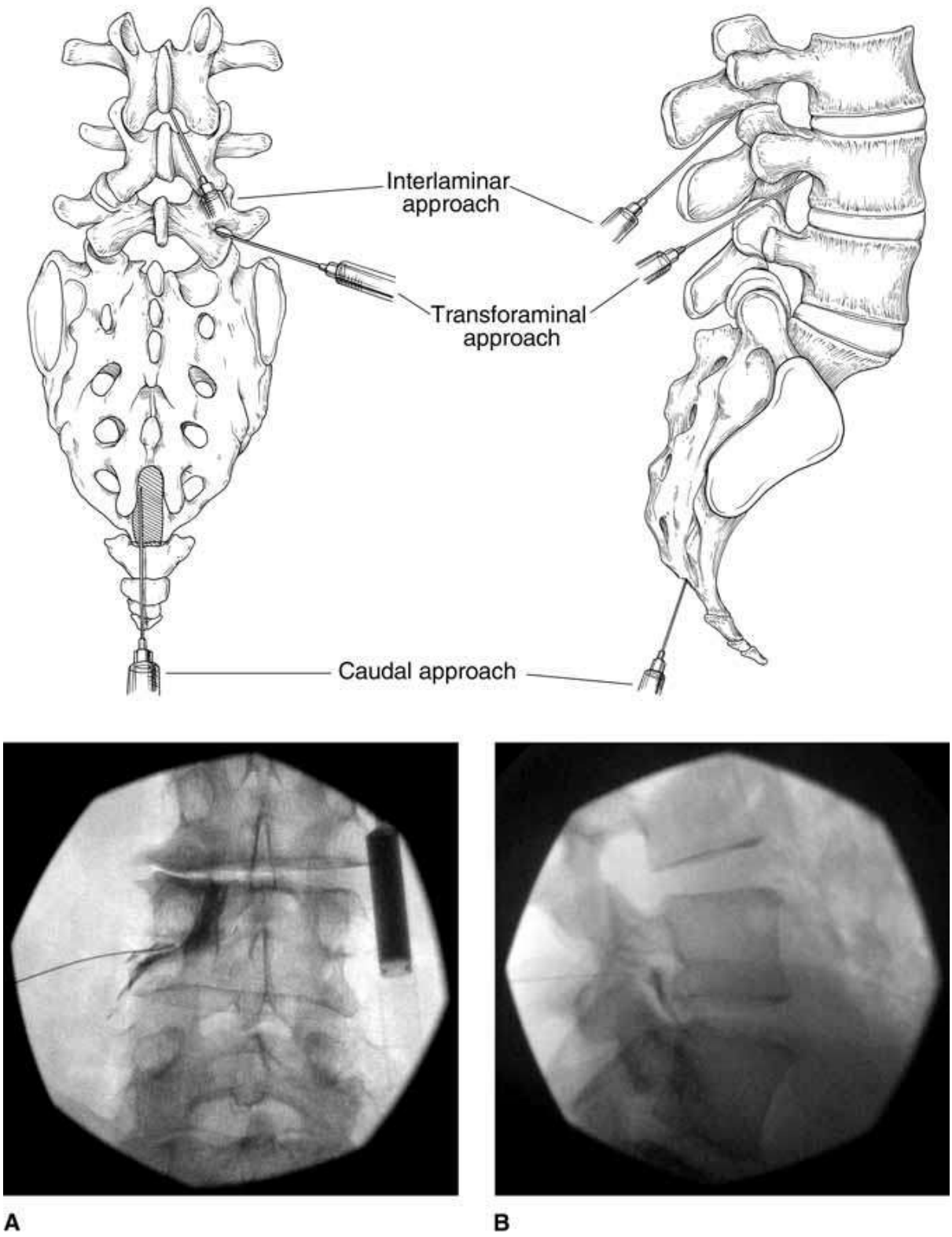


Figure 16: Different approaches of Lumbar epidural steroid injections. A – Showing AP view of lumbar spine with Transforaminal needle in left L4, B – Lateral view.(6)

Complications:

Epidural steroid injection is a relatively safe procedure with complications that are uncommon and usually are temporary not without serious complications, but fortunately they are very rare.(4)

Like any other invasive procedure, ESI have an elemental risk of complications.

Complications of the ESI can be divided as follows:

1. Side effects of the drugs injected
2. Technical hazards of the injection technique
3. Minor and major neurological sequelae

Adverse effects of the drugs injected:

Drugs that are usually injected are Steroids, Local anaesthetics, Contrast material (If fluoroscopy is being used) and normal saline.

Adverse effects associated with Steroids:

Suppression of the hypothalamic pituitary axis- In a study conducted by Jacob S et al, estimated the levels of methyl prednisolone in the blood after ESI and found that there was no systemic absorption. But there was marked decrease in the plasma cortisol levels, even after the injection of synthetic ACTH (Adreno-corticotropic hormone).

They concluded that ESIs will lead to suppression of Hypothalamic pituitary axis and care should be taken when injecting them repeatedly.(35)

Other self limiting side effects of steroids like anxiety, insomnia, facial flushing, agitation, low grade fever, elevated blood sugars.

Allergic reactions to anaesthetic or contrast material if used.

Technical hazards related to the injection technique:

Dural puncture is the most common complication associated with lumbar epidural steroid injections.(4) In a meta-analysis conducted by Watts and Silagy, they found out that there was 2.5% dural punctures with headache in 2.3% patients.(36) It is also important to identify the dural punctures as there is a chance of injecting the potentially hazardous drugs into the subarachnoid space.

Intravascular injection is another complication associated ESIs. In the multicentric prospective study conducted by Sullivan et al, they concluded that chance of intravascular injection was highest in caudal approach. (Transforaminal- 10.8%, Caudal 10.9% and Interlaminar 1.9%). They suggested to use contrast enhanced fluoroscopy to prevent inadvertent injection into the intravascular compartment.(37)

Minor neurological complications include transient increase in sciatica pain, head ache, giddiness, vasovagal syncope, flushing and urinary retention.

Serious complications include Epidural haematoma, epidural abscess and nerve root damage all of which are extremely rare.

Table 6: Complications of ESI

Potential complications of ESI
Technical hazards related to the injection technique - Temporary exacerbation of pain - Dural puncture - Head ache due to dural puncture - Intravascular injection - Nerve root damage* - Infection* - Epidural haematoma*
Medication induced - Steroid: Anxiety, insomnia, agitation, facial flushing, low grade fever, elevated sugars in diabetics, Suppression of hypothalamic pituitary axis - Allergic reaction to local anaesthetics or contrast material.
Minor neurological complications - Vasovagal syncope due to the deep somatic pain of injection, headache, dizziness, stiff neck, urinary retention, hypotension and vomiting

Surgical treatment of sciatica caused by intervertebral disc prolapse:

Sciatica usually resolves without treatment in one third of the patients in the first 2 weeks of presentation and as many as three quarters of patients will be symptom free by the end of 3 months.(38) Surgery in sciatica will help in faster pain relief and better mobility but it is appropriate to postpone the surgery to see if the symptoms resolve whether spontaneously or with conservative treatment alone.(26)

Surgical treatment of sciatica caused by disc prolapse is to decompress the nerve root.

Unilateral hemilaminotomy should be enough in patients with unilateral symptoms.

Previously bilateral laminectomy used to be performed but, nowadays unilateral hemilaminotomy is preferred as it retains the tension and alignments between the adjacent segments.

Microdiskectomy, minimally invasive and percutaneous techniques are also performed nowadays.

Fusion of the adjacent spinal segment is not necessary if surgery is performed at one level and there is no mobile spondylolisthesis.

Outcome measures:

The outcome measures that were used in this study were Revised Owestry disability index (ODI) for low back pain/ dysfunction and Numeric rating scale (NRS).

Owestry disability index(ODI) is a report questionnaire that needs to be filled by the patient; it is a functional outcome measure. It has 10 sections with each section having 6 possible answers rating from 0 to 5 points. The total points that can be attained in this questionnaire are 50, which will be equivalent to 100% or if one section is omitted, then total points would be 45 and the percentage will be measured accordingly.

The interpretation of the disability scores is as follows

0%-20%: Minimal disability:

Most of the activities of daily living can be performed without much difficulty. In these patients no treatment is indicated. Suggestion regarding lifting weights, back care, fitness and diet is all that is necessary.

20%-40% Moderate disability:

These patients will experience more pain on lifting weights, sitting and standing postures. Usually their social life and travelling are not affected. Some of them may be off work. Their personal activities, sexual activity and sleeping are usually not affected. Conservative treatment is usually enough.

40%-60% Severe disability:

Primary problem in these patients is pain. Significant problem may be faced with personal care, sleeping, sexual activity and travel. They need a detailed evaluation.

60%-80% Crippled:

Back pain impacts almost all the aspects of the living in these patients and they need an active treatment.

80%-100% Bed bound

Numeric rating scale (NRS) is verbally administered scale of pain in contrast to the Visual analogue scale (VAS). The advantage of NRS is that it is easy to administer at the point of patient care and can be administered either verbally or in writing. It is a scale of 0-10 with 0 being no pain and 10 being the worst pain possible and even would contemplate suicide due to pain.(39) In this study, we asked for NRS in back, buttock and legs in standing, squatting and sitting positions.

Materials and Methods

Ethics committee and Institutional review board approval was sought for the study.

Type of study:

Prospective cohort study.

All the patients who underwent epidural steroid injection from January to March of 2015 in day-care operation theatre under Spinal disorders surgery unit, Department of Orthopaedics, Christian Medical College, Vellore were recruited.

Inclusion criteria:

1. 20-80 years old patients
2. Sciatica with IVDP or LCS
3. Single level involvement
4. Failed conservative management for more than 6 weeks
5. ODI score more than 40%

Exclusion criteria:

1. Post op patients
2. Multiple level involvement
3. Recurrent hernaitions
4. Cauda equina syndrome
5. Patients having repeat injections.

The ODI and NRS scores were assessed pre-injection in the Outpatient department (OPD), the scores were repeated 24-48 hours after the injection was administered, 1 month, 3 months and 6 months after the injection was administered.

All patients had imaging done either in CMC hospital, Vellore or elsewhere. If the imaging was done elsewhere, it was scanned and uploaded to the CMC Picture Archiving and Communication systems (PACS).

All the patients who were advised to get epidural steroid injection were given routine blood investigations i.e., Haemoglobin, Creatinine, Blood borne Virus screening (HbSAg, HCV and HIV), Random blood sugar and Chest X ray and ECG also were done as and when needed. Pre-anaesthesia check up was done and fitness was

obtained after which they are scheduled a time in Day care operation theatre for the administration of Epidural steroid injection.

Procedure of the epidural steroid injection

All the patients were admitted in the day care ward on the day of injection; vital signs were checked and noted down by trained staff nurses till the scheduled time for injection of the specific patient arrives.

Procedure in the theatre:

Patients were made to lie down on the operating table and all the monitoring devises were connected. A 20G intravenous catheter was inserted and a pint of Normal saline was started.

Positioning:

Patient was positioned to sit with his/ her legs on the side of the table resting on a stool.

Painting and draping:

The back of the patient was painted with Chlorhexidine paint for three times and was draped with disposable drapes.

Identification of the level:

Anatomic levels of the interspinous spaces were identified with the help of the landmark, i.e., Iliac crest which is at the level of the L3-L4 space. Then, the desired level, i.e., one level above the affected level was worked up or down.

Injection procedure:

Once the desired level is identified, generous amounts of local anaesthesia will be given and approximately wait for 20 sec for the local anaesthetic to act. With a 18G Touhey needle with Loss of resistance syringe, epidural space identified with a loss of resistance technique with normal saline. Once the epidural space is reached, pre-mixed solution of 2ml of 80mg Methyl prednisolone and 0.25% Bupivacaine along with 6 ml normal saline is injected and patient is made to lie down supine for 10 minutes.

Then patient is transferred to the recovery room where he will be monitored for around 4 hours and then discharged.

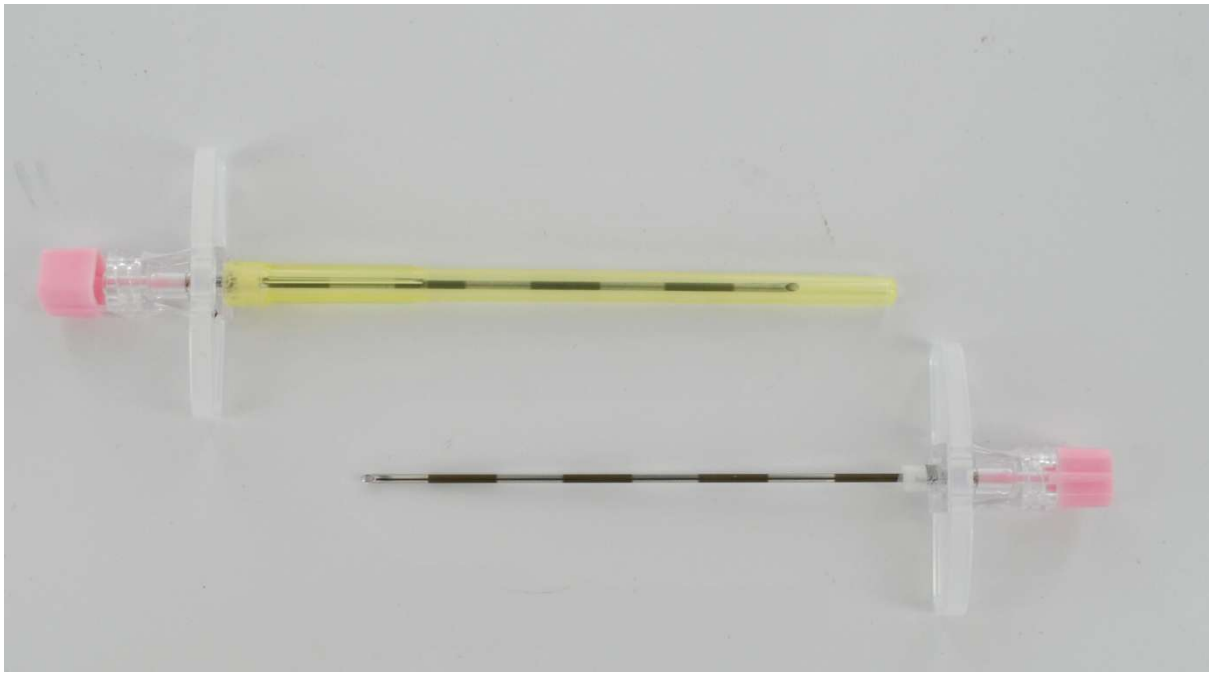


Figure 17 Touhey needle

Figure showing a 18G Touhey needle used for epidural injections

Figure 18: LOR syringe

Figure showing a loss of resistance syringe used in epidural injections.

Figure 19 Position for ESI

Position while injecting the epidural steroid injection. Patient's back is painted with Chlorhexidine paint and draped with sterile disposable drapes. One assistant helps in holding the patient in position.

Figure 20 A vial of 0.25% Bupivacaine

Figure 21: Methyl Prednisolone

A vial of Methyl prednisolone

Follow up:

Patients are contacted on phone and were interviewed for the NRS and ODI scores at regular intervals i.e., 24-48 hours, 1 month, 3 months and 6 months after injection.

Data was collected in the proforma made for the study and entered into epidata.

Statistical analysis:

An epidata file was created for data entry and the data was entered in epidata and was given to a trained statistician for analysis.

Data was analysed with program called STATA using paired T test and Wilcoxon signrank tests.

Results

91 patients were given epidural steroid injections under the Spinal disorders unit, Department of Orthopaedics in Christian medical college and Hospital in day care operation theatre from January 2015 to March 2015.

Out of 91 patients 23 patients had the intervertebral disc prolapse at multiple levels (IVDP), 8 patients were post operative with symptoms and 10 were given multiple injections.

50 patients were included in the study after filtering through the inclusion and exclusion criteria.

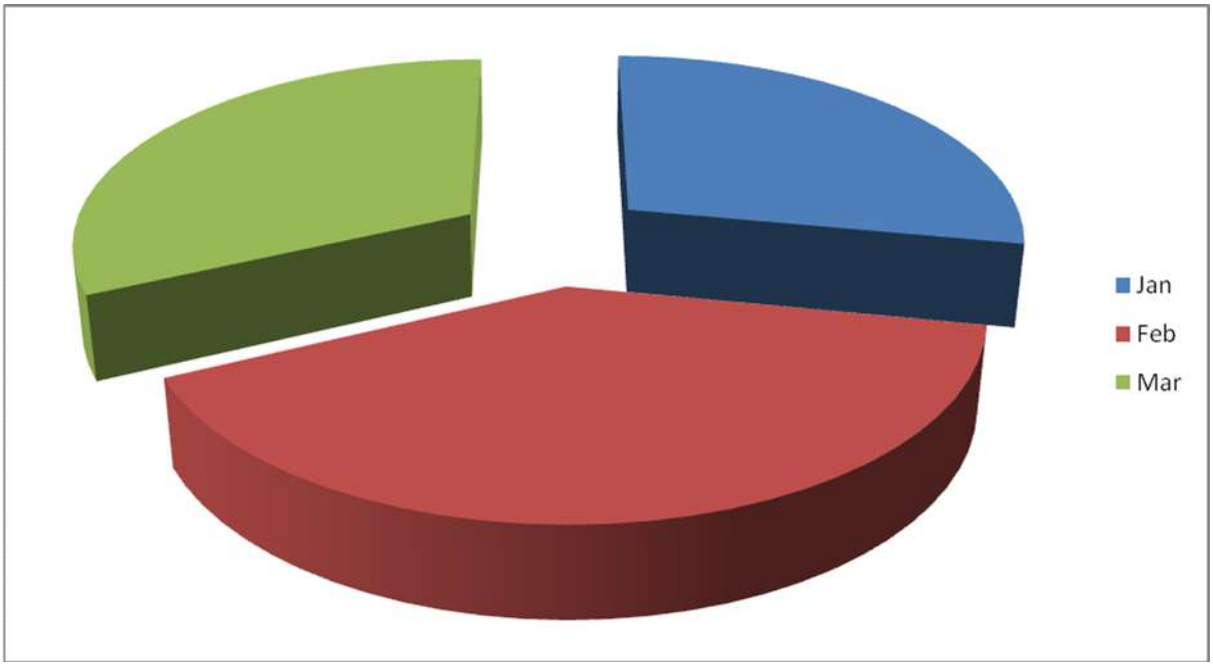
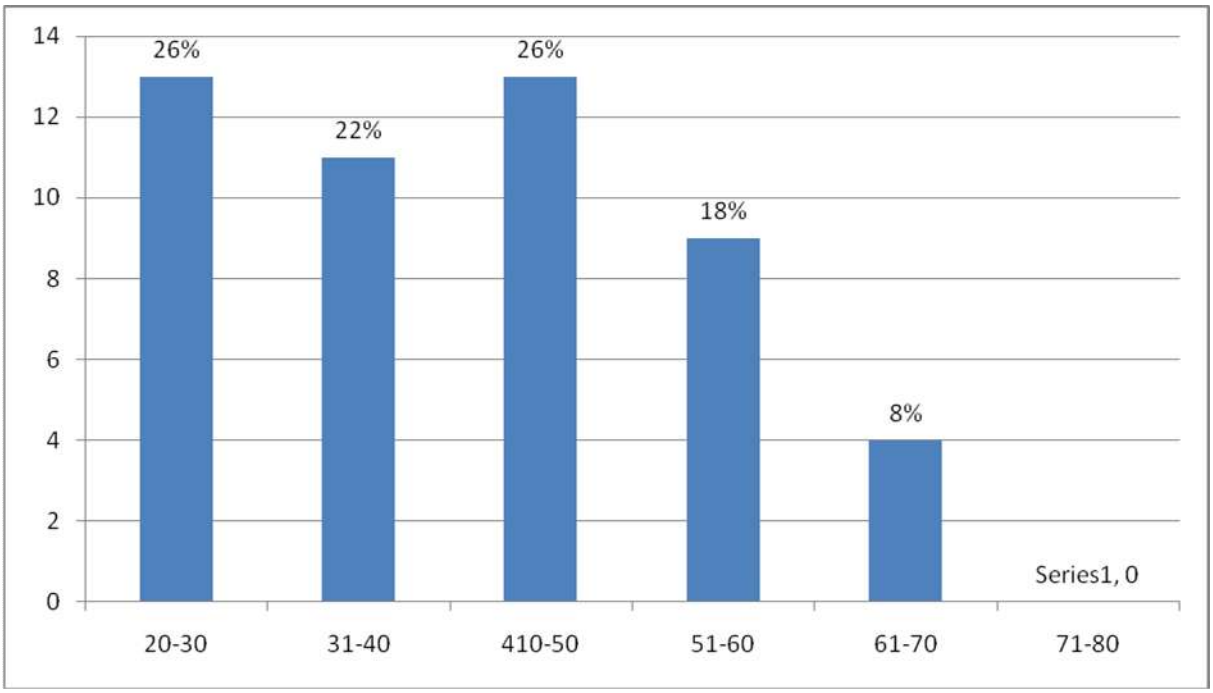


Figure 22: Number of injections as per month. Pie chart showing the number of injections given in each month – January, February and March respectively.

Age distribution:

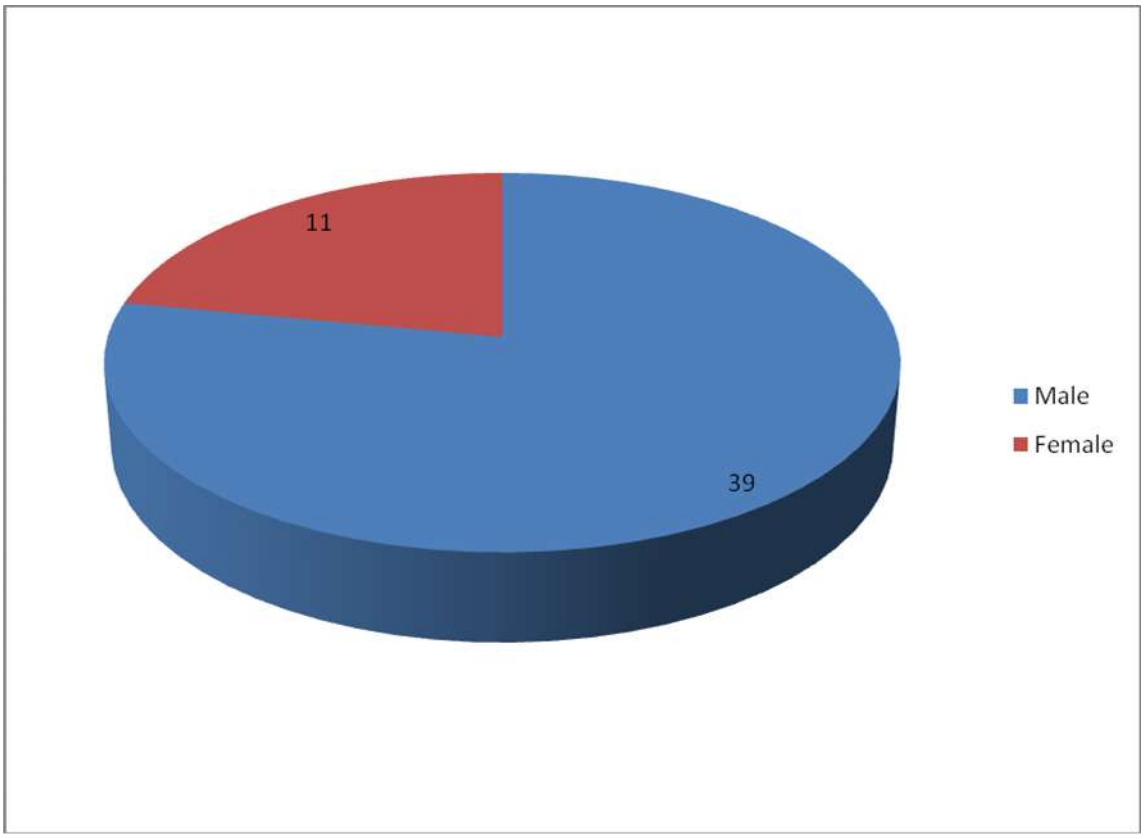


Graph 1: Age distribution of the patients that were included in the study and approximately 92% of them are in the working age group i.e., 20-60.

There were 13 patients in the age group of 20-30, 11 in 31-40, 13 in 41-50, 9 in 51-60 and 4 in 61-70 age groups respectively. So there is 92% of working population in the study group i.e., 20-60 year's age group.

Gender distribution:

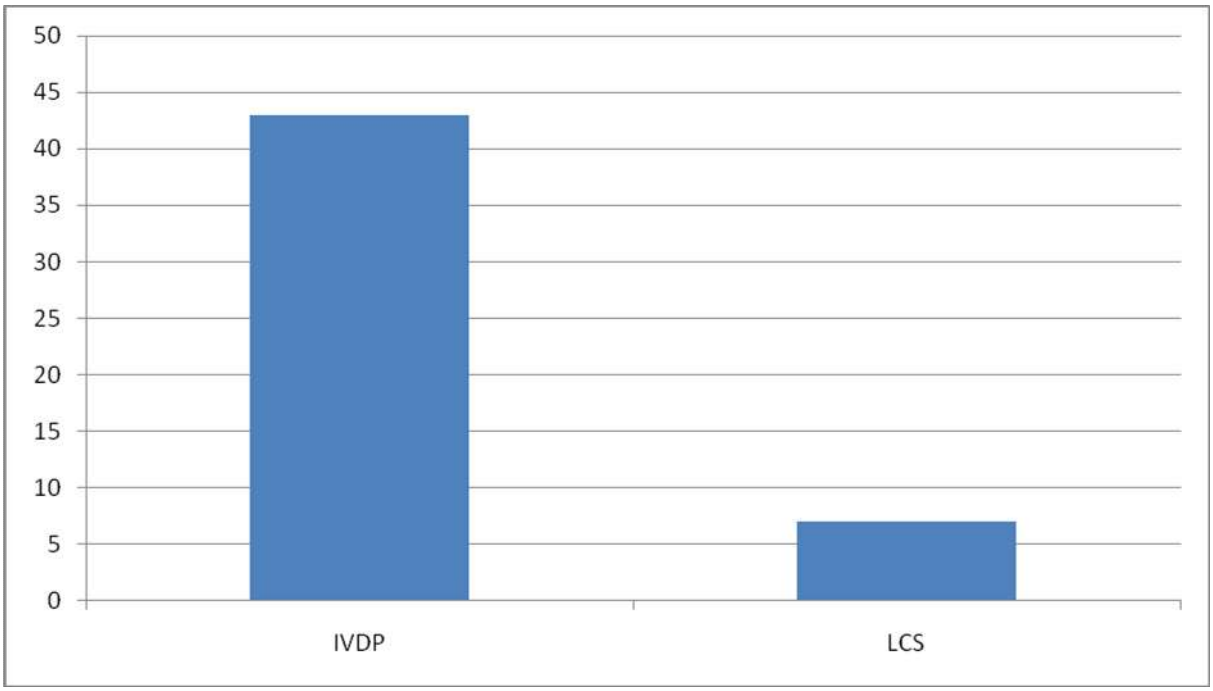
The study population included 11 females (22%) and 39 males (78%).



Graph 2: Gender distribution of the study population. There were 39 male patients and 11 females.

Diagnosis of the patients:

This study included patients with intervertebral disc prolapse and Lumbar canal stenosis at a single level. There were a total of 50 patients included in the study out of which 43 were having intervertebral disc prolapse (IVDP) and 7 patients were having Lumbar canal stenosis.



Graph 3: IVDP and LCS

Graph 3 is showing the number of patients with IVDP and LCS compared.

MSU grade profile of the IVDP patients:

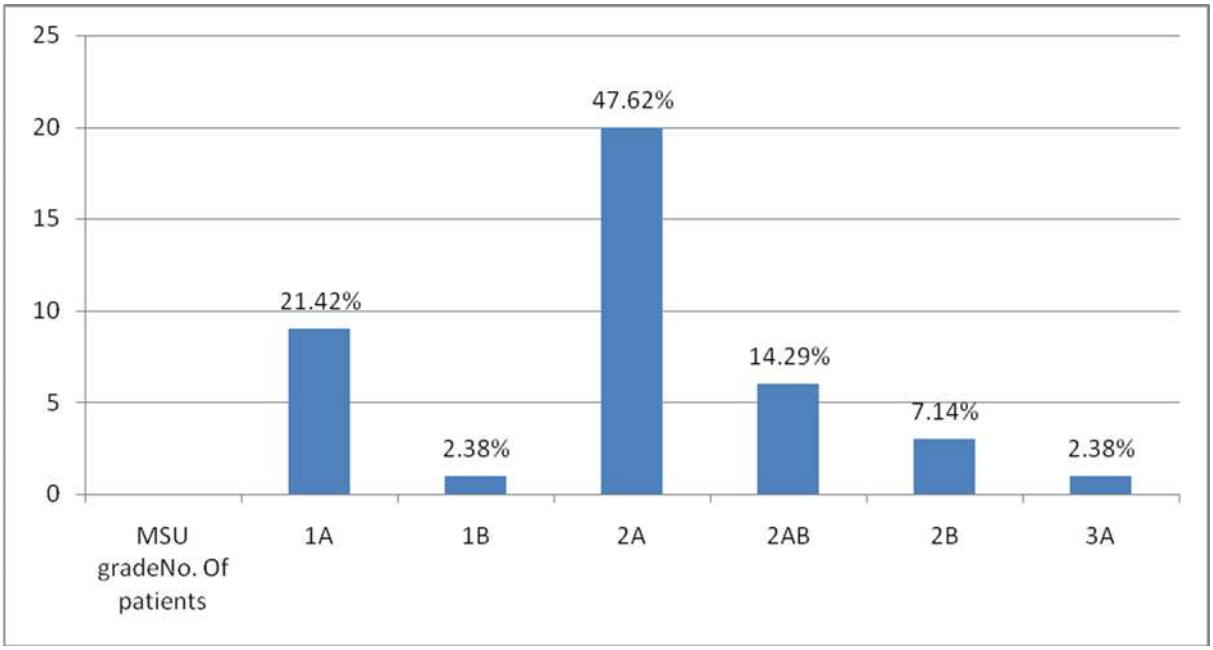
Michigan state university (MSU) grading was done for all the patients with intervertebral disc prolapse(IVDP) depending on the MRI (Magnetic resonance Imaging) of their lumbar spines.

There were 9 patients with 1A, 1 patient with 1B, 2A were 20 patients, 2AB were 6, 2B were 3 and 3A were 1. This distribution was charted on a graph as on below.

Table 7: Distribution of MSU grades

Table showing the Distribution of MSU grades.

MSU grade	Number of patients
1A	9
1B	1
2A	20
2B	3
2AB	6
3A	1



Graph 4: Distribution of MSU grades

Graph 4 is showing the distribution of the patients with respect to their Michigan state university grading.

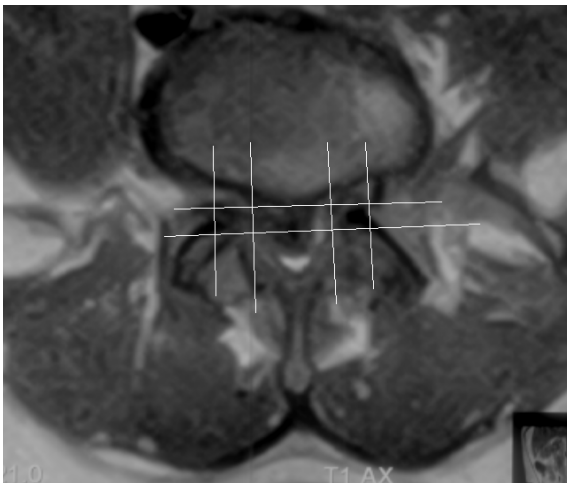


Figure 23: 1A

MSU grade 1A

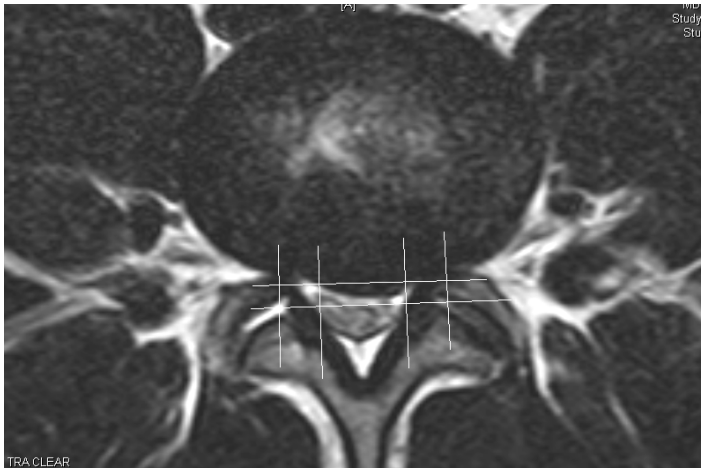


Figure 24: 2A

MSU grade 2A

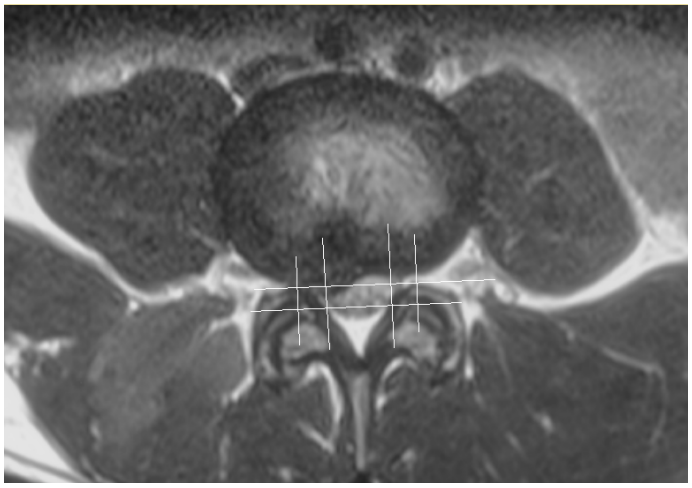


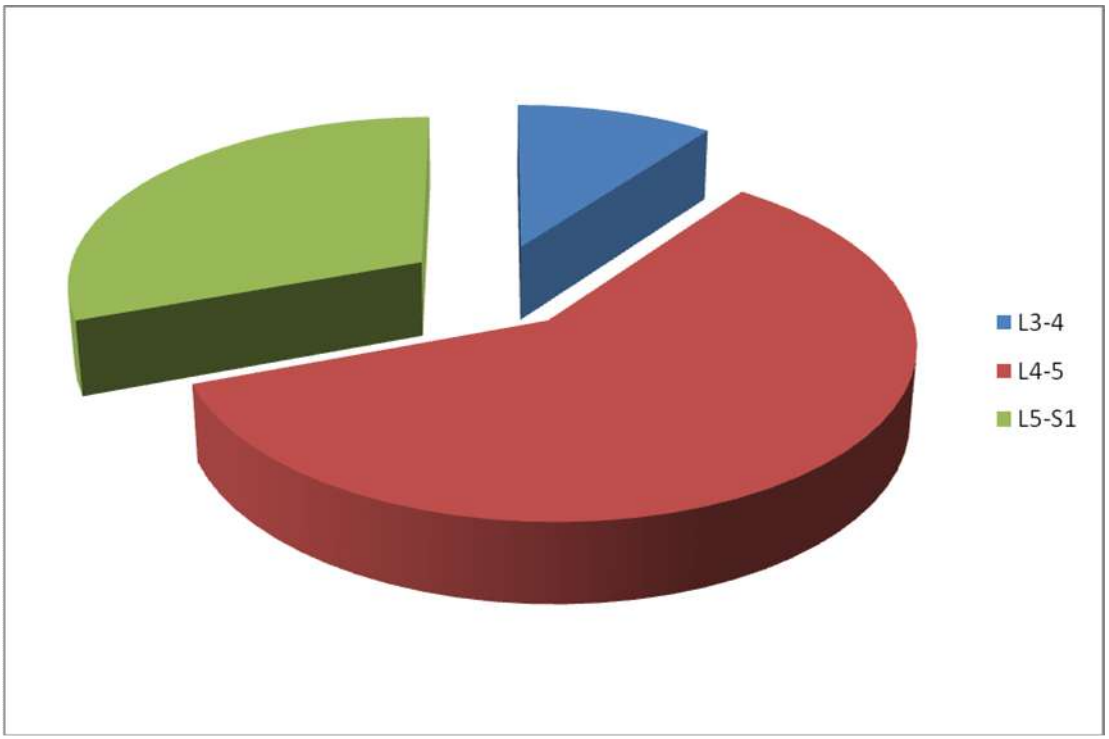
Figure 25: 2AB

MSU grade 2AB

Level of pathology:

There were 5 patients with L3-4, 30 patients with L4-5 and 15 patients with L5-S1 level pathologies as shown in the graph below.

The most common level of pathology in the study group was in L4-5 i.e., 60% of the total population followed by L5-S1 – 30% and then L3-4 – 10%.



Graph 5: Levels of pathology

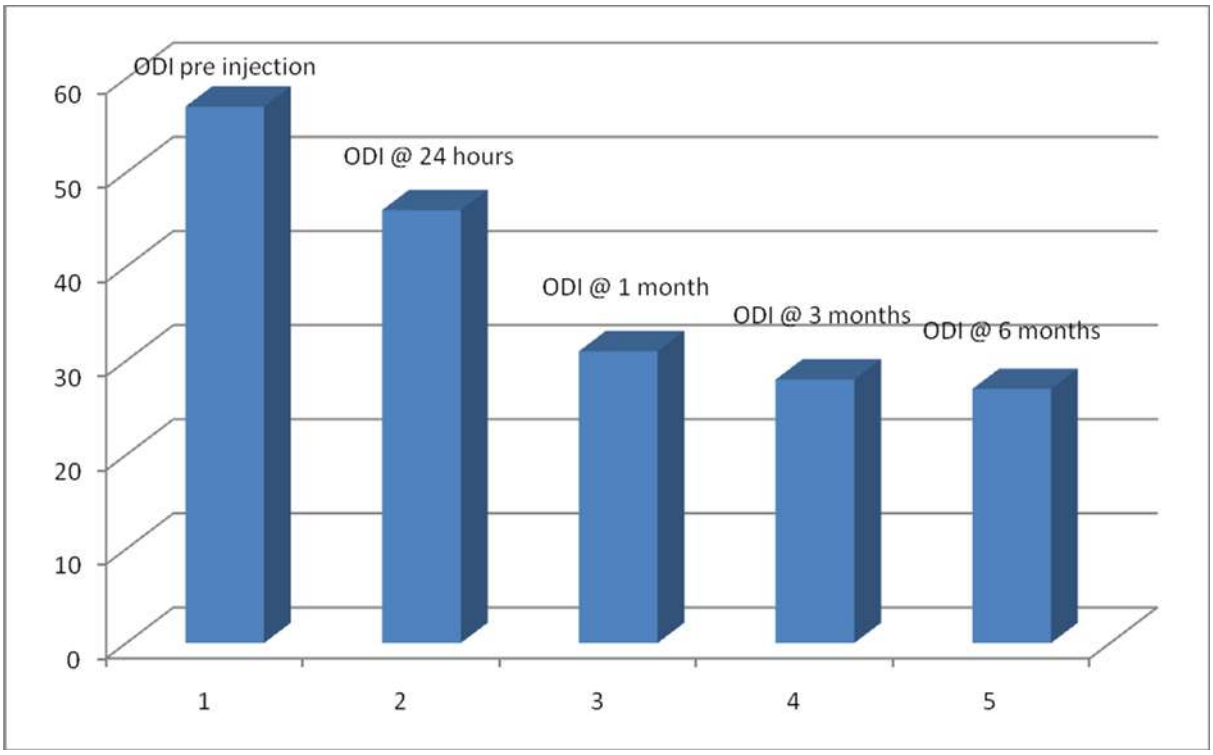
Graph 5 shows the representation of the levels of pathology in pie chart.

Owestry disability Index :

Patients were scored at pre-injection, 24 hours, 1 month, 3 months and 6 months post injection and the average values are as shown in the table below.

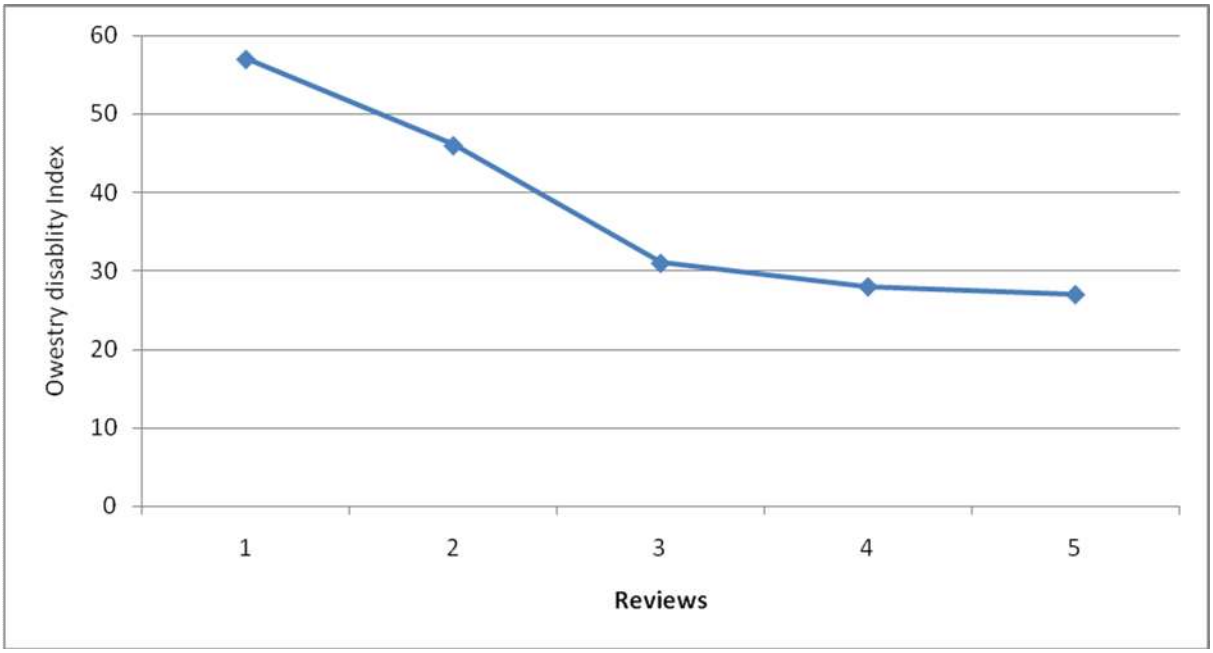
Table 8: Averages of ODI at regular intervals with standard deviation and the statistical significance.

Review	ODI Score(Mean)	Standard deviation	P value
Pre-Injection	57.22	8.52	<0.001
24 hours post	46.35	9.04	<0.001
1 month	31.18	11.14	<0.001
3 months	28.04	11.76	<0.001
6 months	27.95	11.43	<0.001



Graph 6: Average ODI scores

Graph 6 showing the averages of ODI at different intervals.



Graph 7: Trend of ODI scores

Graph 6 showing the downward trend of the Owestry disability index score over time.

Table 9: ODI averages relating to MSU grades

Table showing the ODI scores for patients as relative to the MSU scores and the number of patients that were operated.

	ODI1	ODI2	ODI3	ODI4	ODI5	operated
1A	53.25	43.75	26.5	24	26.5	
1B	52	40	28	22	22	
2A	56.63	44.73	29.89	27	25.63	1
2AB	56.4	51.6	37.6	40	28	3
2B	65.3	54	36	24	29	1
3A	56	44	32	26	22	

Numeric rating scale for pain:

Pain scores were measured with Numeric rating scale (NRS).

Pain scores were rated in leg, buttock and back separately in three different postures i.e., standing, sitting and squatting positions.

Table 10 NRS ratings

Table showing the NRS (Numeric rating scale for pain) pre injection and at 24 hours post injection

	NRS rating Mean (SD) pre injection	NRS rating mean at 24 hours	*P* value
Back – Squatting	6.02 (1.30)	4.49 (1.49)	<0.001
Back – Standing	4.80 (1.18)	3.73 (1.39)	<0.001
Back – Sitting	4.61 (1.51)	3.55 (1.58)	<0.001
Buttock – Squatting	4.16 (1.35)	3.08 (1.31)	<0.001
Buttock – Standing	3.66 (1.21)	2.70 (1.18)	<0.001
Buttock – Sitting	3.32 (1.25)	2.58 (1.23)	<0.001
Leg – Squatting	5.08 (1.67)	3.94 (1.88)	<0.001
Leg – Standing	4.10 (1.43)	3.24 (1.61)	<0.001
Leg – Sitting	4.20 (1.63)	3.31 (1.75)	<0.001

NRS- Numeric rating scale

SD- Standard deviation

Table 11NRS ratings

Table showing the NRS pain ratings at 1 month, 3 months and 6 months after injection.

	NRS rating Median (IQR)@ 1month	NRS rating Median (IQR) @3 months	NRS rating Median (IQR) @ 6 months
Back – Squatting	2.00(1,2)	1.00(1,2)	2.00(1,3)
Back – Standing	1.00(1,2)	1.00(1,1)	1.00(1,2)
Back – Sitting	2.00(1,2)	1.00(1,2)	1.00(1,2)
Buttock – Squatting	1.00(1,1)	1.00(1,2)	1.00(0,2)
Buttock – Standing	1.00(1,2)	1.00(1,1)	1.00(0,1)
Buttock – Sitting	1.00(1,2)	1.00(1,1)	1.00(0,1)
Leg – Squatting	1.00(1,2)	1.00(1,2)	1.00(0,3)
Leg – Standing	1.00(1,2)	1.00(1,2)	1.00(0,2)
Leg – Sitting	1.00(1,2)	1.00(1,2)	1.00(0,2)

NRS- Numeric rating scale

IQR- Inter quartile range

Graph 8: Trend of NRS ratings

Graph 7 shows the downward trend of NRS pain ratings after giving the epidural steroid injection.

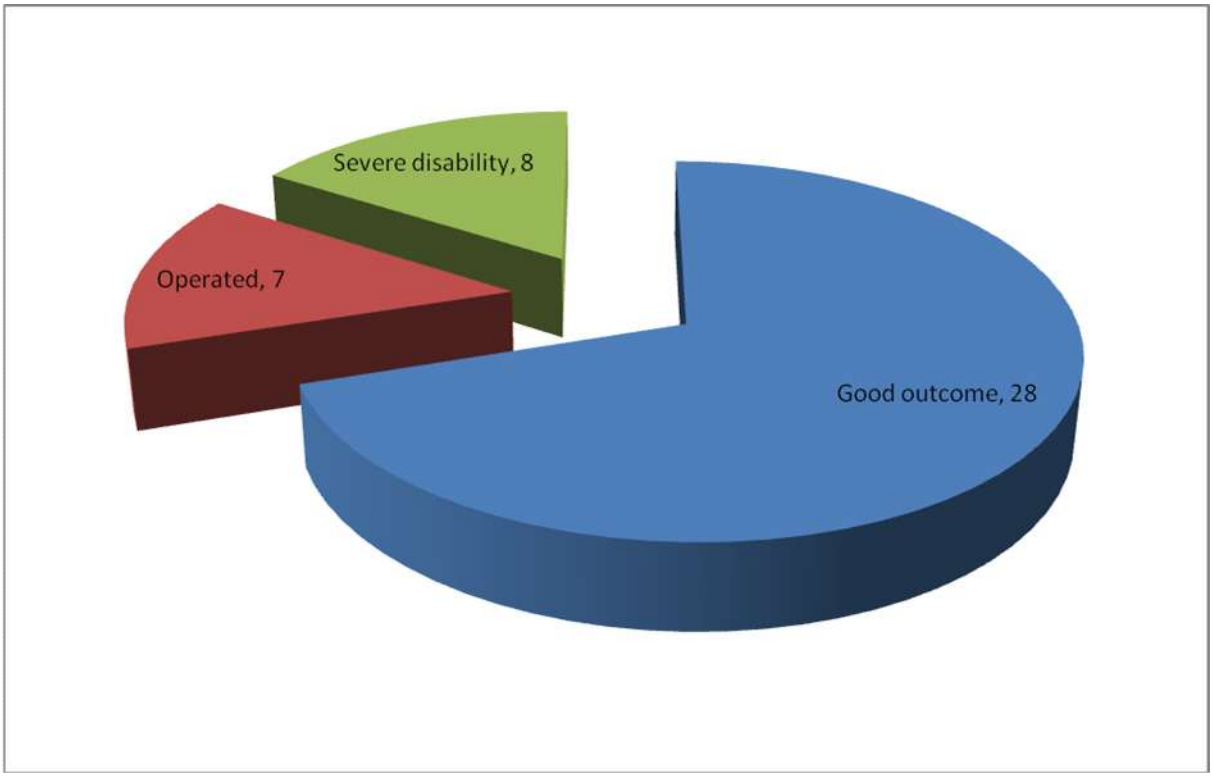
A total of 7 patients (16.7%) underwent Surgical treatment for the sciatica as their symptoms were not better after injection.

For 2 patients at 1 month, 3 months and 5 months after injection and for 1 patient at 4 months after the injection was given.

8 patients (19.04%) had ODI scores of more than 40 i.e., Severe disability at the end of 6 months.

So in 15 patients (35.7%), the injection given was not effective at the end of 6 months, 7 of which were operated and 8 patients were still getting conservative treatment.

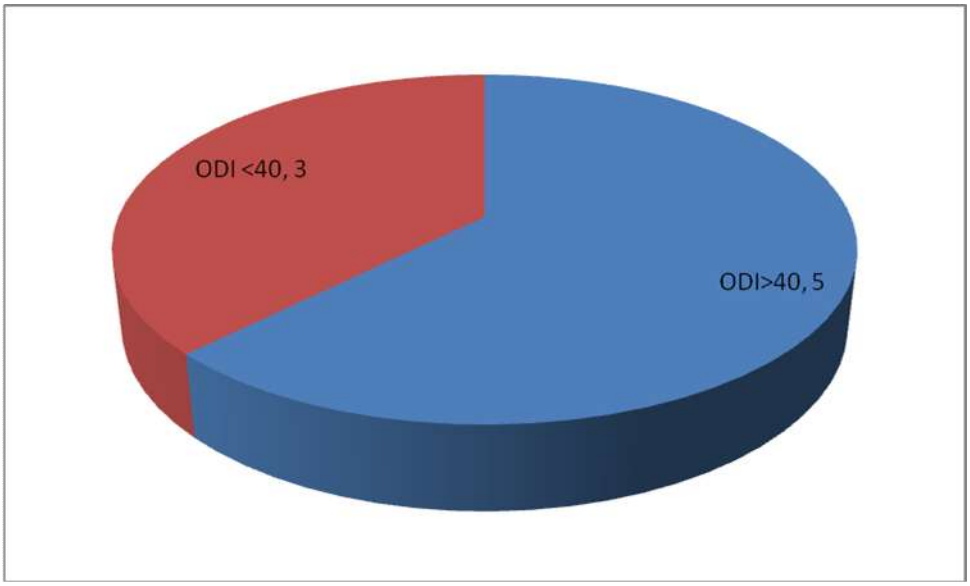
So, 28 (64.28%) of patients had good outcome.



Graph 9 Outcome results

Graph showing the outcomes of the patients as described above.

In patients with Lumbar canal stenosis (LCS), 5 out of 8 patients were having an ODI score more than 40% at the end of 6 months i.e., 62.5% had a bad functional outcome.



Graph 10 ODI in LCS patients

Graph 10 is showing the distribution of patients with LCS depending on the ODI values at 6 months post injection.

Discussion

Burden of the disease:

The global burden caused by low back pain and sciatica is enormous. The impact of the low back pain is seen considerably on individuals, families, communities and health care systems. The impact caused is devastating in low income countries.

The estimated expenditure in USA in 1998 for back pain was $90.7 billion. It was 11 billion pounds in UK in 2000 and low back pain was found to be one of the most costly diseases as the direct and indirect costs were estimated to be $9.17 billion dollars.(40)

Low back pain and sciatica:

Sciatica is caused by (i) Mechanical compression as in Intervertebral disc prolapse, lumbar canal stenosis etc., (ii) Inflammation causing chemical neuritis of the nerve roots and (iii) immune mediate.

Treatment for most of the patients with sciatica is only conservative i.e., Rest, Physical therapy, Medication (NSAIDs, Pregabalin, Gabapentin etc), Short wave diathermy. But some patients who don't respond to conservative management will need further treatment. Surgical treatment gives a rapid pain relief and better

functional outcome but some comparative studies have shown that the long term results are same for surgical and non-surgical management of sciatica.(41–43)

Epidural steroid injections are considered the intermediate between conservative management and surgical management of sciatica.(44,45) Since the first epidural steroid injection given in the 1952 by Robecchi and Capra.(46) They used hydrocortisone which was being replaced by different drugs. The drugs that are mainly used nowadays are Methyl Prednisolone, Triamcinolone, Dexamethasone and Betamethasone.

Justification of Epidural steroid injection:

The pathogenesis of Sciatica as described above is by inflammation, immunity and mechanical compression. Non steroidal anti-inflammatory drugs (NSAIDs) are effective against inflammation but when they are not giving adequate symptomatic relief, steroids are supposed to deliver better response as they act at higher steps in the cascade of inflammation. Steroids are also known to be powerful immune modulators which are implicated in the pathogenesis of sciatica. Steroids also act by inhibiting aggregation of Leukocytes, prevents degranulation of granulocytes, macrophages and mast cells; stabilization of lysosomal membranes. They also inhibit the synthesis and release of substances which are pro-inflammatory like PLA2, Arachidonic acid, IL-1, PG-E2, TNF- α.

Due to these inflammatory substances the nerve roots get inflamed and will become extremely sensitive. These inflamed nerved roots produce pain discharges for prolonged durations even with gentle manipulation or pressure. So steroids are believed to decrease the symptoms. Large and sustained doses of steroids can be delivered locally to the region of pathology via epidural route with minimal or no exchange to the systemic circulation.

In a prospective, double blind randomized controlled study conducted by Breivik and colleagues; they studied 35 patients with low back pain and sciatica which was not responding to the conservative management for a significant amount of time. They studied the outcomes with epidural steroid injections and found that there was a good outcome in 65% of patients and so they could return to work early(47).

In the prospective, randomized controlled study conducted by Ridley et al, they observed a statistically significant improvement in 65% patients who received epidural steroid injection(48).

Buttermann et al in a prospective, non-blinded, randomized controlled study, including 169 patients observed that there was a good or favourable outcome in 56% of patients who got epidural steroid injection. In this study he compared the outcomes

after epidural steroid injection with that of discectomy. He concluded that ESIs are not as good as discectomy in reducing the symptoms or disability when associated with a herniated disc which is large, but they were found to be effective in around half of the patients with symptoms even after 6 weeks of non-invasive conservative management.(43)

In a prospective, double blinded randomized control study conducted by Valat, Rozenberg et al, they concluded that the epidural steroid injections provide no additional benefit.(49)

In the study we conducted, which is a prospective cohort study, there were 91 patients who were given the epidural steroid injection in the study period i.e., January 2015 to March 2015.

There were 23 patients who had intervertebral disc prolapse, 10 patients got multiple epidural steroid injections and 8 patients were post operative.

So a total of 50 patients were included in the study.

42 patients had intervertebral disc prolapse and 8 patients had lumbar canal stenosis.

Out of the 42 patients who had intervertebral disc prolapse, 8 patients (19.0%)had ODI scores more than 40% showing that they have significant morbidity at 6 months

post injection and 7 patients (16.7%) underwent surgical treatment due to persistent symptoms.

There were 64.28% of patients who had good functional outcome at the end of 6 months after injection was given. And this result was consistent with the literature quoted above.

In the meta analysis conducted by Kuan liu et al, they concluded that epidural steroid injections were not giving a statistically significant improvement in symptoms of ability to walk in patients with lumbar canal stenosis.

In the Lumbar canal stenosis group, 5 out of 8 patients had bad functional outcome at the end of 6 months post injection i.e., 62.5% of the patients had a bad functional outcome after giving epidural steroid injection.

In our study we observed that according to Michigan state university classification of the intervertebral disc prolapse, 2A was the most common type. Almost all the types had similar functional outcome scores at the end of 6 months. But it was observed that 3 out of 5 patients with 2AB type underwent surgery as their symptoms did not resolve with the epidural steroid injection.

Incidence of surgery after ESI

The cross over rate from Epidural steroid injection to the discectomy group was mentioned by Butternmann and Riew in different studies. They both observed the cross over rate be around 50%. In Buttermann's randomized controlled study 27 out of 50 (54%) patients from epidural steroid injection underwent discectomy and in Riew's study 29 out of 55 (53%) patients did cross over.(43,50)

In the Meta analysis conducted by William Lavalle et al, they studied a large group of population 482,893 patients were diagnosed to have disc herniation. 27,799 (5.76%) underwent discectomy. 41,420 patients received epidural steroid injections and 9.34% of them underwent discectomy at a later date.(51)

In our study 7 patients out of 42 patients (16.67%) with IVDP underwent discectomy after being given an epidural steroid injection.

The average time period between the epidural steroid injection and the discectomy as was in the study conducted by Buttermann et al was 3.3 months and a range of 1 to 13 months.(43)

In our study there were 2 patients who underwent surgery at 1 month, 2 patients at 3 months, 1 patient at 4 months, 2 patients at 5 months. The average time period between the epidural steroid injection and the surgery was 3.14 months.

Complications:

There were no significant complications in the study group except for the minor complications like transient pain.

Limitations:

The limitations of the study were, this is not a randomized controlled study.

Study population was very small and in particular to study the outcome as relative to the Michigan state university classification of the intervertebral disc prolapse.

The study population of lumbar canal stenosis also was very less.

Time period of follow up is also only midterm. There is need for long term follow up.

Conclusion

We conclude that there is a significant functional improvement both statistically and clinically in patients with intervertebral disc prolapse after giving epidural steroid injections. The outcomes in the lumbar canal stenosis were not satisfactory, but the study population is too less to come to a conclusion on that.

The relation between different types of Michigan state university classification of intervertebral disc prolapse could not be clearly defined as the study population was too low to do so. But we found that patients with 2AB type were more prone to have bad outcome and were more prone to go for surgery.

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Annexure

Functional outcome in patients with Sciatica after giving Epidural steroid injection.

Participant information sheet

What is this study?

This is a research study, the purpose of which is to study the functional improvement in patients with Sciatica i.e., Leg pain associated with or without back pain after giving epidural steroid injection conducted by Dr. Srujun Vadranapu, PG registrar, Department of Orthopaedics under the guidance of Dr. K Venkatesh, Professor, Department of Spinal disorders Surgery, Christian Medical College Hospital, Vellore.

What is the expected duration of the study?

You are expected to be in touch with the primary investigator for a period of 6 months after the injection was given either over phone or by mail.

What are the procedures that you will go through?

You will be screened and a pre-anaesthesia check up is done and an injection will be given in your back bone in the day care operation room by the attending anaesthetic under strict aseptic conditions. You will be monitored after the injection in the day care ward for 2 hours and discharged.

What are the risks associated with this procedure?

There are few risks associated with the procedure - Vasovagal reaction, Dural puncture headache, infection and epidural hematoma. There might be self limiting headache, anxiety, light headedness or any allergic reactions to the local anaesthetic associated with the drugs used. Adverse effects if occur will be dealt with appropriately.

What are the other treatment modality for the problem you have?

The other appropriate treatment modalities like conservative management – physiotherapy, life style modifications and drugs and surgical treatments are also available.

Will your personal data be kept confidential?

The data collected in this process will be kept confidential and will be used only for the research purposes. Your personal information and all the data will be procured and preserved by the primary investigator. The results of this study will be published in medical journal but you will not be identified by name in any publication or presentation of results. However, your medical notes may be reviewed by people associated with the study without your additional permission, should you decide to participate in this study.

What are your responsibilities if you choose to take part in the study?

If you wish to take part in the study, you are to respond to the queries related to the study, either by post or by phone.

Correct and credible information is expected from you.

Can I withdraw from the study?

You are free to withdraw from the study at anytime you feel to do so. It will not have any bearing on your treatment from the care-givers and you will continue to get the best possible care required for your condition in our hospital.

You can voluntarily participate and also not participate according to your own will.

1. **For doubts and queries:**

Dr. Srujun Vadranapu,
PG Registrar,
Department of Spinal disorders and Surgery Office
1st floor, Paul Brand Building
Christian Medical College Hospital, Vellore
Ph. No: 04162282020

e-mail: srujun.doc@gmail.com

ఎపిడ్యూరల్ స్టెరాయిడ్ ఇంజక్షన్ ఇవ్వడం తర్వాత తుంటి నొప్పి రోగుల్లో క్రియాత్మకఫలితం.

పార్టిసిపెంట్ సమాచారం షీట్

ఈ అధ్యయనం వెన్నెముక వెన్ను శస్త్ర చికిత్సశాఖ, క్రిస్టియన్ మెడికల్ కళాశాల మరియు హాస్పిటల్ వెల్లూర్ లో చేపడ్తున్నాము. ఇది డాక్టర్ కె వెంకటేష్, ప్రొఫెసర్, SDS శాఖ ఆధ్వర్యంలో డాక్టర్ Srujun Vadranapu నిర్వహించినది. ఈ అధ్యయనంలో మేము ఎపిడ్యూరల్ స్టెరాయిడ్ ఇంజక్షన్ చేయించుకుంటున్న రోగులకు ఫంక్షనల్ ఫలితాన్ని అంచనా వెయ్యటానికి ప్రయత్నిస్తున్నాం. రోగులు క్రమ ప్రకారం తం వైద్యం పొందుతుండగా ఎవరైతే ఈ నిర్దిష్టమైన ప్రక్రియ పొందుతారో వారిని ఈ అధ్యయనం లో చేర్చుకుంటాము. ఈ అధ్యయనం లో చేర్చబడ్డ రోగులకు స్క్రీనింగ్ OPD లో జరగబడును మరియు MRI స్కాన్ చేసి ఉండవలెను ఈ సూది మందు ఇచ్చిన తర్వాత రోగులకు స్క్రీనింగ్ 2 రోజుల లోపు, 1 నెల, మూడు నెలలు, 6 నెలల తర్వాత ఫోన్ ద్వార లేదా పోస్ట్ ద్వార చెయ్యబడును. ఈ ప్రక్రియలో సేకరించిన డేటా రహస్యంగా ఉంచబడుతుంది మరియు పరిశోధన ప్రయోజనాల కోసం మాత్రమే ఉపయోగించబడుతుంది. ఈ అధ్యయనం లో రోగి స్వచ్ఛందం గ పాల్గొనుటకు లేదా పల్గోనకుడా ఉండుటకు అవకాశం ఉంది.

ఈ అధ్యయనం ద్వార రోగికి ఏదైనా ప్రమాదం ఉందా?

లేదు, ఈ అధ్యయనం లో సాధారణంగా జరుగుతున్న వైద్యం లో రోగులలో వస్తున్న క్రియాత్మక ఫలితాన్ని అధ్యయనం చేస్తున్నాము.

అధ్యయనం మొదలైన తర్వాత రోగి ఈ అధ్యయనం నుండి ఉపసంహరించుకోవచ్చా?

రోగికి ఎప్పుడైనా ఈ అధ్యయనం నుండి ఉపసంహరించుకోవాలి అనిపిస్తే వారికి ఇష్టమైనట్టు చెయ్యవచు. అల చెయ్యటం వాళ్ళ తనకు ఇవ్వబడే వైద్యం లో ఎటువంటి వ్యత్యాసం కూడా ఉండదు.

ఈ అధ్యయనం వాళ్ళ రోగి ఎమన్నా అధిఖమైన ఖర్చు అవుతుందా?

ఏ అదనపు ఖర్చు లేదు.

వ్యక్తిగత వివరాలు రహస్యంగ ఉంచబడతాయ?

ఈ అధ్యయనం యొక్క ఫలితాలు వైద్య పత్రికలో ప్రచురించబడుతుంది, అయితే, మీ వ్యక్తిగత వివరాలు బయల్పరచబడవు. మీరు ఈ అధ్యయనం లో పాలుపొందుతకు ఒప్పుకున్నత్తితే, మీ వైద్య సంబంధమైన వివరాలను విచారించుటకు ఈ అధ్యయనం చేస్తున్న వారు మళ్ళీ మీ వద్ద అనుమతి తీస్కోవలసిన అవసరం లేదు.

సందేహాలు మరియు ప్రశ్నలను:

డాక్టర్. . Srujun Vadranapu, స్పైనల్ లోపాలు మరియు సర్జరీ శాఖ, పాల్ బ్రాండ్ బిల్డింగ్, క్రిస్టియన్ మెడికల్ కాలేజ్ హాస్పిటల్, వెల్లూర్ Ph భాగం: 04162282020

முதுகு தண்டுவடத்தில் ஊசியின் மூலம் ஸ்டீராய்ட் மருந்து குடுப்பதினால் எற்றுபடும் பயனை ஆராயும் ஆய்வு

பங்கேற்பவர் தகவல் படிவம்

இந்த ஆராய்ச்சி கிறிஸ்தவ மருத்துவர் கல்லூரியில் உள்ள முதுகுத்தண்டு அறுவை சிகிச்சை பிரிவினால் நடத்தபடுகிறது. இவ்வாராய்ச்சி முதுகுத்தண்டு அறுவை சிகிச்சை நிபுணர் மருத்துவர் K. வெங்கடேஷ் அவர்களின் வழிகாட்டுதலின் கீழ் மருத்துவர் ஸ்ருஜன் அவர்களால் நடத்தப்படுகிறது. இந்த ஆராய்ச்சியின் மூலம் முதுகு தண்டுவடத்தில் ஊசியின் மூலம் ஸ்டீராய்ட் மருந்து குடுப்பதினால் எற்றுபடும் பயனை ஆராய உள்ளோம். இவ்வாராய்ச்சியில் சேரும் நபர்களளுக்கு எமது மூதுகுதண்டு அறுவை சிகிச்சை பிரிவின் மருத்துவ விதிமுறைகளின் படி சிகிச்சை அளிக்கப்படும். இவ்வாராய்ச்சியில் சேரும் நபர்கள் சிகிச்சையின் முன்பு அவர்களுடைய செயல்திறனையும் வலியினையும் அளவிடும் சில கேள்விகளுக்கு புறநோயாளிகள் பிரிவில் மருத்துவரை சந்திக்கும் நேரத்தில் பதிலளிக்க வேண்டும். மேலும் நோயை கண்டறியவும் அதின் தீவிரத்தை அளவிடவதற்கும் எதுவாக MRI ஆய்வையும் மேற்கொண்டிருக்க வேண்டும். சிகைட்சியின் பின்பு தொலைபேசியின் மூலமாகவோ கடிதத்தின் மூலமாகவோ சிகிச்சையை பெற்றவரிடத்தில் சிகிட்சையின் பலனை ஆராயும் வண்ணம் சில கேள்விகள் கேட்கப்படும். இவ்வாறு சேகரிக்கும் தகவல்கள் அனைத்தும் இவ்வாராய்ச்சிக்கு மட்டுமே பயன்படுத்தப்படும். மேலும் இவை இரகசியமாகப் பாதுகாக்கப்படும். இந்த ஆராய்ச்சியில் நோயாளி தங்கள் சொந்த விருப்பத்தின் பேரில் பங்குகொள்ளவோ விலகிகொள்ளவோ முடியும்.

இந்த ஆய்வினால் பின்விளைவுகள் ஏதேனும் வர வாய்ப்பு உள்ளதா?

இல்லை. இந்த ஆய்வு உங்கள் நோய்க்கான மருத்துவ சிகிட்சையை எந்த விதத்திலும் பாதிக்காது.

ஆய்வு ஆரம்பித்த பின் இந்த ஆய்வை விட்டு விலகிக்கொள்ளலாமா?

இந்த ஆய்வை விட்டு எப்பொழுது வேண்டுமானாலும் நோயாளி விலகிக்கொள்ளாலாம். இதனால் மருத்துவ சிகிட்சை எந்த விதத்திலும் பாதிக்கப்படாது.

இந்த ஆராய்ச்சியில் பங்கு கொள்வதானால் கூடுதல் செலவு ஏதேனும் எற்றபடுமா?

இல்லை. இந்த ஆராய்ச்சியில் பங்கு கொள்வதானால் சிகைட்சைகான செலவை தவிர்த்து கூடுதல் செலவு எதுவும் எற்றபடாது.

இவ்வாய்வில் பங்குகொள்பவரின் தாவல்கள் பாதுகாக்கப்படுமா?

இவ்வாய்வில் சேகரிக்கும் தகவல்கள் அனைத்தும் ஆராய்ச்சிக்கு மட்டுமே பயன்படுத்தப்படும். மேலும் இவை இரகசியமாகப் பாதுகாக்கப்படும். இவ்வாய்வில் உங்கள் மருத்துவ பதிவேடுகளில் உள்ள தகல்வல்களும் பயன்படுத்தப்படும்.

மேலும் விவரங்களுக்கு:
மருத்துவர் ஸ்ருஜன்,
முதுகுத்தண்டு அறுவை சிகிச்சை பிரிவு அலுவலகம்,
பால் பிராண்ட் கட்டிடம் - முதல் மாடி ,
கிறிஸ்தவ மருத்துவ கல்லூரி மருத்துவமனை, வேலூர்.
தொலைபேசி எண்: 04162282020

Functional outcome in patients with Sciatica after Epidural steroid

Informed Consent form

Patient's Name: _____

Hospital No. _____

(i) I confirm that I have read and understood the information sheet for the above study and have had the opportunity to ask questions. [ ]

(ii) I understand that my participation in the study is voluntary and that I am free to withdraw at any time, without giving any reason, without my medical care or legal rights being affected. . [ ]

(iii) I understand that the Ethics Committee and the regulatory authorities will not need my permission to look at my health records both in respect of the current study and any further research that may be conducted in relation to it, even if I withdraw from the trial. I agree to this access. However, I understand that my identity will not be revealed in any information released to third parties or published. [ ]

(iv) I agree not to restrict the use of any data or results that arise from this study provided such a use is only for scientific purpose(s). [ ]

(v) I agree to take part in the above study. [ ]

Signatory's name: Date: _____/_____/_____	Signature (or Thumb impression) of the Subject/Legally Acceptable
Study investigator's Name Date: _____/_____/_____	Signature of the Investigator:
Name of the Witness: Date: _____/_____/_____	Signature (or Thumb impression) of the Witness:

ఎపిడ్యూరల్ స్టెరాయిడ్ ఇంజక్షన్ పొందిన అనంతరం తుంటి నొప్పి రోగుల్లో క్రియాత్మక ఫలితం

సమ్మతి పత్రం

రోగి యొక్క పేరు

హాస్పిటల్ సంఖ్య

(i) నేను పైన అధ్యయనం కోసం సమాచారం షీట్లు చదివి అర్థం చేసుకున్నాను మరియు ప్రశ్నించేందుకు అవకాశం కలిగింది అని నిర్ధారిస్తున్నాను.

(ii) ఈ అధ్యయనం లో నేను పాలుపొందుట నా స్వచ్ఛంద నిర్ణయం అనియు, ఏ సమయం లో అయిన, ఏకారణం లేకుండా అయిన నేను వెనుతిరుగుట వలన నాకు వైద్య మరియు చట్ట సంబంధంగా ఎటువంటి ఇబ్బంది ఉండదు అని నేను అర్థం చేసుకున్నాను.

(iii) ఎథిక్స్ కమిటీ మరియు నియంత్రణ అధికారులు ఈ అధ్యయనం కొరకు మరియు భవిష్యత్తులో వేరే పరిశోధనల కొరకు, ఒక వేళ నేను ఈ అధ్యయనం నుండి వెనుదిరిగినప్పటికీ నా ఆరోగ్య రికార్డులను పరిశోధించుటకు నా అనుమతి అవసరం లేదని నేను అర్థం చేసుకున్నాను. ఈ ప్రాప్తి కి నేను అంగీకరిస్తున్నాను. అయినప్పటికీ, నా గుర్తింపు మూడవ పార్టీకి బయలుపరచబడదు అనియు ముద్రింపబడదు అనియు నేను అర్థం చేస్కున్నాను.

(iv) ఈ అధ్యయనం ద్వారా ఉత్పన్నమయ్యే ఏ డేటా లేదా ఫలితాలు శాస్త్రీయ ప్రయోజనం కోసం ఉపయోగించుటకు నేను అడ్డగించను అని ఒప్పుకుంటున్నాను.

(v) నేను పై అధ్యయనం పాల్గొనడానికి అంగీకరిస్తున్నాను

సంతకం లేదా వేలు ముద్ర	సాక్షి పేరు మరియు సంతకం
తేది	తేది

అధ్యయన పరిశోధకుల పేరు మరియు సంతకం

తేది

முதுகு தண்டுவடத்தில் ஊசியின் மூலம் ஸ்டீராய்ட் மருந்து குடுப்பதினால் எற்றுபடும் பயனை ஆராயும் ஆய்வு

தகவல் அறிந்து சம்மதம் தெரிவிப்பு படிவம்

நோயாளியின் பெயர்:
மருத்துவமனை எண்:

(i) மேலே உள்ள ஆய்வு தகவல் தாளை நான் படித்து புரிந்து கொண்டேன் என்றும் கேள்விகள் கேட்க வாய்ப்பு கிடைத்தது. மேலும் ஊசியோ அறுவை சிகிச்சையோ இல்லாத சிகிச்சை முறைகளும் எடுதுரக்கப்பட்டன என்று உறுதி செய்கிறேன்.[ ]

(ii) இந்த ஆய்வில் பங்கேற்பது என் விருப்பம் என்றும், நான் எந்த நேரத்திலும் எந்த காரணமும் கொடுக்காமல், என் மருத்துவ தேவைகள் மற்றும் சட்ட உரிமைகள் பாதிக்காமல் விலகிக்கொள்ள முடியும் என்று புரிந்துகொள்கிறேன்.[ ]

(iii) நெறிமுறைகள் குழு, மற்றும் கட்டுப்பாட்டு அதிகாரிகள் ஆகியோர் தற்போதைய ஆய்விற்க்கும் மேலும் எதிர்கால ஆராய்ச்சிகள் தொடர்பாக என் மருத்துவ பதிவுகளை பார்க்க என் அனுமதி தேவையில்லை என்பதை புரிந்துகொண்டு சமதிக்கிறேன். எனினும், என் அடையாளம் மூன்றாவது நபர்களுக்கு வெளியிடப்படாது என்பதை புரிந்துகொண்டேன்.[ ]

(iv) இந்த ஆய்வில் எழும் முடிவுகளை அறிவியல் நோக்கத்திற்காக பயன்படுத்த எனக்கு தடை இல்லை.[ ]

(v) இந்த ஆய்வில் பங்கேற்க நான் ஏற்கிறேன்.[ ]

பெயர்:
தேதி:
கையொப்பம்/அல்லது கைநாட்டு:

விசாரணை செய்பவரின் பெயர்:
தேதி:
கையொப்பம்:

சாட்சியின் பெயர்:
தேதி:
கையொப்பம்:

Proforma for the study

"Functional outcome in patients with sciatica after giving epidural steroid injection"

Patient's name:

Hospital number:

Age: Sex:

Ph No:

Date of injection:

Diagnosis:

Level of pathology:

MSU grade:

Complications:

Operated after injection:

	Standing					Sitting					Squatting				
	Pre	24h	1	3	6	Pre	24h	1	3	6	Pre	24h	1	3	6
Leg															
Buttock															
Back															
ODI ODI															

The Revised Oswestry Disability Index (for low back pain/dysfunction)

Patient name: _____ File #_____ Date: _____

This questionnaire has been designed to give the doctor information as to how your back pain has affected your ability to manage everyday life. Please answer every section and mark in each section only the ONE box that applies to you. We realize that you may consider that two of the statements in any one section relate to you, but please just mark the box that most closely describes your problem.

SECTION 1-PAIN INTENSITY

- ☐ The pain comes and goes and is very mild.
- ☐ The pain is mild and does not vary much.
- ☐ The pain comes and goes and is moderate.
- ☐ The pain is moderate and does not vary much.
- ☐ The pain comes and goes and is very severe.
- ☐ The pain is severe and does not vary much.

SECTION 2-PERSONAL CARE

- ☐ I would not have to change my way of washing or dressing in order to avoid pain.
- ☐ I do not normally change my way of washing or dressing even though it causes some pain.
- ☐ Washing and dressing increases the pain, but I manage not to change my way of doing it.
- ☐ Washing and dressing increases the pain and I find it necessary to change my way of doing it.
- ☐ Because of the pain, I am unable to do some washing and dressing without help.
- ☐ Because of the pain, I am unable to do any washing and dressing without help.

SECTION 3-LIFTING

- ☐ I can lift heavy weights without extra pain.
- ☐ I can lift heavy weights, but it causes extra pain.
- ☐ Pain prevents me from lifting heavy weights off the floor, but I manage if they are conveniently positioned (e.g., on a table).
- ☐ Pain prevents me from lifting heavy weights off the floor.
- ☐ Pain prevents me from lifting heavy weights, but I can manage light to medium weights if they are conveniently positioned.
- ☐ I can only lift very light weights at the most.

SECTION 4-WALKING

- ☐ I have no pain on walking.
- ☐ I have some pain on walking, but it does not increase with distance.
- ☐ I cannot walk more than one mile without increasing pain.
- ☐ I cannot walk more than 1/2 mile without increasing pain.
- ☐ I cannot walk more than 1/4 mile without increasing pain.
- ☐ I cannot walk at all without increasing pain.

SECTION 5-SITTING

- ☐ I can sit in any chair as long as I like.
- ☐ I can only sit in my favorite chair as long as I like.
- ☐ Pain prevents me from sitting more than one hour.
- ☐ Pain prevents me from sitting more than 1/2 hour.
- ☐ Pain prevents me from sitting more 10 minutes.
- ☐ I avoid sitting because it increases pain right away.

SECTION 6-STANDING

- ☐ I can stand as long as I want without pain.
- ☐ I have some pain on standing, but it does not increase with time.
- ☐ I cannot stand for longer than one hour without increasing pain.
- ☐ I cannot stand for longer than 1/2 hour without increasing pain.
- ☐ I cannot stand for longer than 10 minutes without increasing pain.
- ☐ I avoid standing because it increases the pain right away.

SECTION 7-SLEEPING

- ☐ I get no pain in bed.
- ☐ I get pain in bed, but it does not prevent me from sleeping well.
- ☐ Because of pain, my normal night's sleep is reduced by less than 1/4.
- ☐ Because of pain, my normal night's sleep is reduced by less than 1/2.
- ☐ Because of pain, my normal night's sleep is reduced by less than 3/4.
- ☐ Pain prevents me from sleeping at all.

SECTION 8-SOCIAL LIFE

- ☐ My social life is normal and gives me no pain.
- ☐ My social life is normal, but increases the degree of pain.
- ☐ Pain has no significant effect on my social life apart from limiting my more energetic interests, e.g., dancing, etc.
- ☐ Pain has restricted my social life and I do not go out very often.
- ☐ Pain has restricted my social life to my home.
- ☐ I have hardly any social life because of the pain.

SECTION 9-TRAVELLING

- ☐ I get no pain while travelling.
- ☐ I get some pain while travelling, but none of my usual forms of travel makes it any worse.
- ☐ I get extra pain while travelling, but it does not compel me to seek alternative forms of travel.
- ☐ I get extra pain while travelling, which compels me to seek alternative forms of travel.
- ☐ Pain restricts all forms of travel.
- ☐ Pain prevents all forms of travel except that done lying down.

SECTION 10-CHANGING DEGREE OF PAIN

- ☐ My pain is rapidly getting better.
- ☐ My pain fluctuates, but is definitively getting better.
- ☐ My pain seems to be getting better, but improvement is slow at present.
- ☐ My pain is neither getting better nor worse.
- ☐ My pain is gradually worsening.
- ☐ My pain is rapidly worsening.

nam	hosp	age	sex	adx	doi	diag	leve	mru	com	op	dos	nbs	nbs	nbsl	nbu	nbus	nbus	nst1	nsq1	nsi1	od1	nbs	nbs	nbsl	nbu	nbus	nbus	nst2	nsq2	nsi2	od2	nbs	nbs	nbsl	nbu	nbus	nbus	nst3	nsq3	nsi3	od3	nbs	nbs	nbsl	nbu	nbus	nbus	nst4	nsq4	nsi4	od4	nbs	nbs	nbsl	nbu	nbus	nbus	nst5	nsq5	nsi5	od5
Va	293	34	2	1	02/01/15	1	2	2A		F		0	0	0	0	0	0	8	6	8	70	0	0	0	0	0	0	7	5	6	40	0	0	0	0	0	0	5	3	4	26	0	0	0	0	0	0	3	2	4	24	0	0	0	0	0	0	2	2	4	30
Md	131	69	1	3	09/01/15	2	2			F		7	7	5	4	4	4	4	3	5	64	6	6	3	3	3	3	4	3	4	54	3	3	2	2	2	2	2	2	2	30	2	2	1	2	2	2	2	2	2	26	2	3	1	1	2	2	2	1	3	34
PAI	127	45	2	3	14/01/15	1	2	2A		F		6	6	4	4	4	3	8	6	8	70	5	6	3	3	3	3	8	7	8	68	2	1	2	2	1	2	3	2	3	30	2	1	2	2	1	1	2	2	3	28	3	2	2	1	1	1	3	3	3	28
CH	414	68	1	2	16/01/15	2	4			F		6	4	3	6	3	3	5	3	3	66	6	3	3	5	3	3	4	3	3	40	1	1	1	1	1	1	1	1	1	20	2	1	1	1	1	1	1	1	1	26	4	3	2	4	1	1	4	2	1	42
KA	718	48	1	2	16/01/15	2	2			F		7	3	3	6	3	3	5	3	3	66	6	3	3	6	2	3	4	3	3	46	1	1	1	1	1	1	1	1	1	16	1	1	1	2	1	1	1	1	1	26	5	3	2	4	1	1	4	2	1	44
SU	128	56	1	2	16/01/15	1	2	1A		F		6	5	5	5	3	3	8	6	6	72	6	5	5	4	3	3	7	6	6	62	1	2	1	1	1	1	2	2	2	30	1	1	1	1	1	1	2	1	1	26	1	1	1	1	1	1	1	2	1	26
BA	137	42	1	2	21/01/15	1	2	2A	2fd	F		6	4	4	3	3	3	3	3	3	58	5	4	4	3	3	2	3	3	3	46	2	2	2	1	1	1	1	1	2	26	6	5	4	3	3	3	4	3	3	52										
BIS	137	44	1	3	21/01/15	1	2	2B		F		7	6	6	3	3	3	5	5	5	64	6	6	6	3	3	3	4	4	5	56	1	1	1	1	1	1	1	1	1	22	2	1	1	1	1	1	2	1	1	24	3	3	2	1	1	1	1	2	2	30
TU	130	27	2	2	21/01/15	1	3	2A		F		7	4	5	4	3	3	7	5	5	70	5	3	4	3	2	2	6	5	4	44	2	1	2	2	1	2	2	1	2	22	2	1	2	2	1	2	2	2	2	32	6	3	4	4	3	2	5	4	5	44
BA	071	36	1	3	23/01/15	1	3	2AB		F		5	4	4	3	3	3	4	3	3	52	4	3	2	2	2	2	3	2	2	44	2	1	1	1	1	1	1	1	1	30	1	0	0	1	1	0	1	1	0	28	2	1	1	1	1	1	2	1	2	30
PAI	937	41	2	1	23/01/15	2	2		Fai	F		6	5	5	5	5	5	6	6	5	48	6	5	5	6	5	5	6	6	4	50	5	6	6	4	5	5	6	6	5	50																				
DIL	123	65	1	2	28/01/15	1	1	2A		F		7	5	5	4	4	4	6	6	6	50	6	3	3	4	2	2	5	5	4	44	2	1	1	1	1	1	2	1	1	28	1	1	1	1	1	1	2	1	1	24	2	1	1	2	1	1	2	2	1	24
NA	141	20	1	2	30/01/15	1	1	2AB		F		6	5	4	4	4	4	2	2	1	48	4	4	5	4	3	3	2	2	1	44	1	1	1	1	1	1	1	1	1	14	1	0	0	0	0	0	0	0	0	12	1	1	1	0	0	0	0	0	0	14
MD	134	28	1	3	31/01/15	1	2	2A		F		6	4	4				4	3	3	48	4	2	2				3	1	1	42	2	1	1				1	1	1	28	1	1	1				1	1	1	24	2	1	2				1	1	2	30
BA	942	57	1	2	04/02/15	1	3	2A		F		6	6	7	0	0	0	0	0	0	74	4	3	5	0	0	0	0	0	0	56	4	4	2	0	0	0	0	0	0	38	1	1	1	0	0	0	0	0	0	24	1	1	1	0	0	0	0	0	0	18
SR	149	38	1	2	04/02/15	1	3	1A		F		7	5	5	5	4	4	5	4	4	56	5	4	5	4	3	4	3	3	4	48	2	1	2	1	1	1	1	1	1	28	1	1	1	1	1	1	1	1	1	26	3	2	2	1	1	1	2	1	1	30
BA	709	48	2	2	06/02/15	1	1	1A		F		5	4	4	4	4	4	6	5	5	48	3	3	3	3	3	2	4	3	5	36	1	1	1	1	1	1	1	1	2	24	1	0	0	1	0	0	1	1	1	18	1	1	1	1	1	1	2	2	2	22
VIJ	699	63	2	1	06/02/15	1	2	2B		T	05/06/15	8	8	8	5	5	5	7	6	7	76	8	8	8	5	5	5	8	6	7	64	7	6	7	4	4	5	6	6	7	56																				
Md	163	38	1	2	09/02/15	1	2			T	08/07/15	7	5	6	3	3	4	6	5	5	68	6	4	5	3	3	3	5	4	4	52	5	2	3	2	2	2	3	3	3	40	8	6	6	4	3	4	6	5	5	58										
PAI	093	41	1	1	11/02/15	1	3	2AB		T	08/05/15	7	6	6	5	5	4	5	4	5	62	7	6	6	5	5	4	6	4	5	64	6	6	6	5	5	4	6	4	5	60																				
SO	145	43	1	2	11/02/15	1	3			F		5	6	0	3	5	0	3	4	0	56	3	3	0	1	2	0	1	2	0	38	1	1	0	1	0	0	1	0	0	18	1	1	0	0	0	0	0	0	0	14	1	1	0	0	0	0	0	0	0	14
TA	117	46	1	2	11/02/15	1	3	2A		F		5	5	8	1	1	1	1	1	3	48	4	3	6	1	1	2	1	1	3	40	1	1	1	1	1	0	1	1	0	26	1	1	1	0	0	0	0	0	0	18	1	1	1	0	1	0	0	1	0	14
AN	122	30	2	2	13/02/15	1	2	1A		F		5	4	4	3	2	2	3	3	3	52	3	3	2	2	2	2	2	2	2	46	1	1	1	1	1	1	1	1	1	22	2	2	2	2	2	2	3	3	2	32	4	3	3	2	2	2	3	3	3	38
DH	153	52	1	2	13/02/15	1	2	2A		F		6	5	5	4	3	3	4	3	3	58	4	4	4	3	3	3	3	3	3	50	2	1	2	1	1	2	1	1	2	32	4	3	3	2	2	3	3	2	3	42	5	4	4	3	3	3	3	3	4	48
SW	151	41	1	3	18/02/15	1	2	2A		F		7	3	1	5	5	1	5	2	1	62	4	3	0	3	5	0	3	2	0	48	2	1	0	1	1	0	1	1	0	26	1	1	0	1	1	0	1	1	0	18	1	1	0	0	0	0	1	0	0	14
DE	139	32	1	2	20/02/15	1	1	2A		F		6	5	5	5	5	4	6	5	5	56	4	4	3	3	3	3	5	3	4	42	2	1	2	1	1	1	1	1	1	28	1	1	1	1	1	1	1	1	1	18	2	1	1	1	1	1	2	1	1	22
JOY	156	26	1	3	20/02/15	1	2	2A		F		6	5	5	4	4	4	5	4	4	48	4	4	3	2	2	2	3	3	2	36	1	1	1	1	1	1	1	1	1	24	1	1	1	1	1	1	1	1	1	20	2	1	2	1	1	1	1	1	1	24
AN	153	55	2	1	25/02/15	2	2			T	31/03/15	8	6	6	5	5	5	8	6	6	68	8	6	6	5	4	5	8	6	6	68	7	6	6	5	5	5	7	6	6	62																				
BA	290	56	1	1	25/02/15	2	3			F		6	4	4	5	4	4	6	5	4	56	4	3	3	3	2	3	3	3	4	42	2	1	1	1	1	1	2	1	1	28	1	1	1	1	1	1	1	1	1	26	2	2	2	1	1	1	2	2	1	30
MA	159	26	1	2	25/02/15	1	2		No	F		7	6	6	5	5	4	6	5	5	62	5	5	4	4	4	3	5	4	3	48	2	2	2	1	1	1	2	1	1	32	2	2	2	1	1	1	1	1	2	28	6	5	5	5	4	4	5	4	4	52
AN	152	40	1	2	27/02/15	1	2	2A		F		6	5	5	5	4	4	5	4	4	42	3	3	3	2	2	1	3	2	2	34	1	0	1	0	0	0	1	0	0	22	1	1	0	0	0	0	0	0	0	18	1	1	1	0	0	0	0	0	0	14
ASI	094	29	1	2	27/02/15	1	2	2AB		T	10/08/15	8	5	6	5	4	5	6	5	5	68	6	5	5	4	3	4	5	4	4	58	3	2	3	2	2	2	2	3	2	42	7	6	6	5	5	5	6	5	5	62										
MIT	159	22	1	3	27/02/15	1	3			F		7	5	5	6	4	4	6	4	4	52	4	4	4	3	3	3	4	4	3	42	2	2	1	1	1	1	1	1	1	28	1	0	1	0	0	0	0	0	0	22	1	0	0	0	0	0	0	0	0	18
CH	152	34	1	1	04/03/15	1	2			F		6	4	4	5	5	4	6	5	5	52	4	3	3	3	3	3	5	4	4	46	2	2	1	1	1	1	3	2	2	34	1	1	1	1	0	1	2	2	2	30	1	2	2	1	1	1	3	2	2	36
JITI	258	42	1	2	04/03/15	4	2	2A		F		5	5	4	3	3	3	4	3	3	48	3	3	2	2	2	2	2	2	2	36	1	1	1	1	1	1	1	1	1	32	5	4	4	2	3	3	3	3	3	42										
Ek	171	20	2	2	06/03/15	1	2	2A		T	10/04/15	7	6	6	5	5	5	7	7	5	62	7	6	6	5	5	5	7	6	5	62	8	8	7	6	5	5	8	7	6	64																				
Md	167	39	1	3	06/03/15	1	1	1A		F		6	5	5	5	3	3	5	4	3	48	4	3	4	3	2	2	3	2	2	36	2	1	2	1	0	1	##		1	28	1	1	1	1	0	1	1	0	1	22	1	1	1	0	0	0	0	1	0	20
NA	159	58	1	2	11/03/15	2	2			F		5	4	5	3	3	3	7	6	6	62	4	2	3	2	2	2	5	5	6	54	2	1	1	1	1	1	2	2	2	38	3	2	2	2	2	2	4	5	3	40	3	2	3	2	2	3	5	4	5	46
RA	171	38	1	2	11/03/15	1	2	1A		F		6	5	5	5	3	3	5	3	4	52	4	4	4	3	2	2	4	3	2	44	2	2	2	1	1	1	2	1	1	30	1	1	1	1	1	1	1	1	1	28	2	2	1	1	1	1	1	1	1	32
SH	142	26	1	2	11/03/15	1	3	2A		F		7	4	4	4	3	3	5	3	3	58	5	3	3	3	2	2	5	2	3	42	4	2	2	2	1	1	2	1	1	38	4	1	1	2	1	1	2	1	1	40	4	1	1	2	1	1	3	1	1	44
AB	173	55	1	3	13/03/15	1	3	2B		F		6	5	5	3	3	3	4	3	4	56	4	3	4	2	2	2	2	2	3	42	2	2	2	1	1	1	1	1	2	30	1	1	1	1	1	1	1	1	1	24	2	1	1	1	1	1	1	1	1	28
KA	137	56	1	2	13/03/15	1	3	1B		F		3	3	3	7	6	6	3	3	3	52	2	2	2	5	5	4	2	2	2	40	1	1	1	3	2	2	1	1	1	28	1	1	1	1	1	1	1	1	1	22	0	1	1	2	2	2	0	0	0	22
MA	003	23	2	2	13/03/15	1	2	1A		F		4	4	4	4	4	4	6	5	5	46	3	3	3	3	3	3	4	3	3	38	2	2	2	2	2	2	2	2	3	28	1	1	1	1	1	1	2	2	2	26	2	2	2	1	1	1	2	2	1	32
SA	228	42	1	1	13/03/15	1	2	3A		F		6	5	5	4	4	3	4	3	4	56	4	3	3	2	2	2	2	1	3	44	2	2	2	1	1	1	1	1	1	32	1	1	1	1	0	1	0	0	0	26	1	1	1	0	0	0	0	0	0	22
SU	169	25	1	2	13/03/15	1	2	2A		F		6	5	5	5	4	3	5	3	5	56	3	4	3	3	2	2	2	2	3	48	2	2	1	1	1	1	1	1	2	32	1	1	1	0	1	0	1	0	0	26	1	1	1	0	0	0	0	0	0	24
VIR	164	21	1	2	13/03/15	1	3	2AB		T	03/07/15	7	6	5	5	5	4	6	6	6	52	5	5	4	3	4	4	5	6	5	48	5	4	3	3	4	3	5	5	5	42	7	6	5	5	5	5	6	6	6	58										
ALA	170	39	2	1	18/03/15	1	2		No	F		6	5	4	4	4	3	5	4	5	62	5	4	3	3	3	3	3	3	4	48	3	2	2	2	2	2	2	3	3	38	4	4	2	3	3	3	4	4	4	42	5	5	4	3	4	4	5	4	5	48
DE	165	58	1	2	20/03/15	1	3	2A		F		6	5	5	4	3	3	4	4	4	46	4	3	3	3	2	2	2	2	2	32	2	2	2	1	1	1	1	1	1	18	1	1	1	1	0	0	0	0	0	14	1	0	0	0	0	0	0	0	0	8
SU	169	42	1	3	25/03/15	1	3	2A		F		6	5	5	5	4	4	5	4	5	52	4	3	3	3	2	3	4	2	2	40	2	2	2	1	1	1	1	1	1	28	1	1	1	1	1	1	1	1	1	22	1	1	1	1	1	1	0	0	0	24
MC	183	31	1	3	27/05/15	1	2	1A		F		5	4	4	4	3	3	4	4	3	52	3	2	2	2	1	1	2	1	1	40	2	1	1	1	1	1	1	1	1	22	1	1	1	1	0	0	1	0	0	14	1	0	0	0	0	0	0	0	0	12